Defence Research and Development Canada
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Review of Collaborative Tools for Planning and Engineering

Final Report

Tab Lamoureux and Lisa Rehak

This report documents work completed March 2007

Defence R&D Canada – Ottawa
CONTRACT REPORT
DRDC Ottawa CR 2007-206
October 2007

Canada

Review of Collaborative Tools for Planning and Engineering

Final Report

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This report documents work completed March 2007.

Defence R&D Canada – Ottawa

Contract Report
DRDC Ottawa CR 2007-206
October 2007

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Abstract

The objectives of this work were (1) to survey the marketplace for available tools that may provide collaborative environments to support Synthetic Environment based exercises and experiments, and evaluate the most relevant candidates and (2) to develop an evaluation method for assessing collaborative planning and engineering tools. A literature review was conducted, followed by Subject Matter Experts (SMEs) interviews. A total of 215 collaborative tools were uncovered.

In order to develop an evaluation method for these tools, it was realized that users of collaborative planning and engineering tools would have specific uses for the tools or goals for the tools known prior to tool selection. Further, specific requirements would be desired of the tools. This led to the creation of the Evaluation Matrix which was used to evaluate select collaborative tools. Research and development opportunities can also be identified through the evaluation matrix. Finally, a number of changes are proposed for the evaluation matrix. The authors feel that this project has provided an important first step toward the technological support of distributed planning and engineering teams.

Résumé

Les objectifs du présent ouvrage étaient (1) d'étudier le marché pour trouver les outils offerts qui peuvent procurer des environnements de collaboration pour appuyer les exercices et les expériences dans des environnements synthétiques et d'évaluer les candidats les mieux qualifiés; et (2) d'élaborer une méthode pour évaluer les outils de planification et d'ingénierie en collaboration. Une analyse documentaire a été effectuée, suivie d'entrevues avec des experts en la matière (EM). On a découvert au total 215 outils de collaboration.

Afin d'élaborer une méthode d'évaluation pour ces outils, on a réalisé que les utilisateurs des outils de planification et d'ingénierie en collaboration les utiliseraient à des fins précises ou connaitraient les objectifs à atteindre avant la sélection des outils. De plus, il serait souhaitable d'avoir des exigences précises pour les outils. On a donc créé une matrice d'évaluation, que l'on a utilisée pour évaluer des outils de collaboration choisis. Les possibilités de recherche et développement ont également été cernées grâce à la matrice d'évaluation. Enfin, un certain nombre de changements sont proposés pour la matrice d'évaluation. Les auteurs croient que ce projet a constitué une importante première étape vers le soutien technologique des équipes de planification et d'ingénierie réparties.

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Executive summary

The DRDC Ottawa Future Forces Synthetic Environments (FFSE) section has been established to provide a Research and Development (R&D) centre of excellence in the area of Synthetic Environments (SE) and Capability Engineering (CE). The overall objective is to study and develop requirements of a collaborative environment that would be exploited in the development of SE-based exercises and events to facilitate collaboration and data sharing during SE development.

The objectives of this work are two-fold:

- Survey the marketplace for available tools that may provide collaborative environments to support SE-based exercises and experiments, and evaluate the most relevant candidates;
- Develop an evaluation method for assessing collaborative planning and engineering tools.

The first step in the project was to conduct a literature review. Immediately following the literature review, Subject Matter Experts (SMEs) were interviewed for the project. A total of 215 collaborative tools were uncovered during these stages of the project.

In order to develop an evaluation method for these tools, it was realized that users of collaborative planning and engineering tools would have specific uses for the tools or goals for the tools known prior to tool selection (e.g. Communication and/or Design). Further, specific requirements would be desired of the tools (e.g. Usable) where only a subset of requirements would be applicable to each use/goal. The team attempted to maximise the orthogonality between the uses/goals and the requirements. This led to the creation of the Evaluation Matrix with the 'Uses/Goals' down the left (vertical axis) and the 'Requirements' along the top (horizontal axis).

The evaluation matrix was used to evaluate five collaborative tools: SharePoint, NetMeeting, LiveLink, Groove and Google Docs. Based on these scores, SharePoint ranked as the most appropriate collaborative tool overall. However, based on specific uses/goals desired of a collaborative tool another tool may be better suited. Once a number of tools have been evaluated, it will then be possible to select specific tools for specific uses/goals, based on their score.

Research and development opportunities can be identified through the evaluation matrix also by: (1) looking at requirement scores and (2) looking at use/goal scores. For example,the provision of a searchable, writable database with reusable classes is a poorly met requirement. Examples of poorly achieved uses/goals were 'simulation/demonstration' and 'network development'.

A number of changes are proposed for the evaluation matrix developed in order to better able to accommodate comments about specific judgements. Further changes are suggested concerning the scoring system to permit direct comparisons between different scores.

The authors feel that this project has provided an important first step toward the technological support of distributed planning and engineering teams.

Lamoureux, T.L and Rehak, L.A. 2007. Review of Collaborative Tools for Planning and Engineering. DRDC Ottawa CR 2007-206. Defence R&D Canada – Ottawa.

Sommaire

La section des Environnements synthétiques des forces de l'avenir (ESFA) de RDDC Ottawa a été établie pour fournir un centre d'excellence en recherche et développement (R & D) dans les domaines des environnements synthétiques et de l'ingénierie des capacités (IC). L'objectif global consiste à étudier et à formuler des exigences pour un environnement de collaboration qui serait exploité dans la mise au point d'exercices et d'activités fondés sur l'ES afin de faciliter la collaboration et le partage de données pendant la création de l'ES.

Les objectifs de présent ouvrage comportent deux volets :

- Étudier le marché pour trouver des outils existants qui pourraient procurer des environnements de collaboration pour appuyer les exercices et les expériences dans des environnements synthétiques et d'évaluer les candidats les mieux qualifiés;
- Élaborer une méthode pour évaluer les outils de planification et d'ingénierie en collaboration.

La première étape du projet était d'effectuer une analyse documentaire. Immédiatement après celle-ci, on a interviewé des experts en la matière pour le projet. Pendant ces étapes du projet, on a découvert au total 215 outils de collaboration.

Afin d'élaborer une méthode d'évaluation pour ces outils, on a réalisé que les utilisateurs des outils de planification commune et d'ingénierie les utiliseraient à des fins précises ou connaîtraient les objectifs à atteindre avant la sélection des outils (p. ex. Communication et/ou conception). De plus, il serait souhaitable d'avoir des exigences précises pour les outils (p. ex. utilisable) où seulement un sous-ensemble d'exigences s'appliquerait à chaque utilisation/objectif. L'équipe a essayé de maximiser l'orthogonalité entre les utilisations/objectifs et les exigences, ce qui a abouti à la création de la matrice d'évaluation qui comprend les « utilisations/objectifs » à gauche (axe vertical) et les « exigences » dans le haut (axe horizontal).

La matrice d'évaluation a été utilisée pour évaluer cinq outils de collaboration : SharePoint, NetMeeting, LiveLink, Groove et Google Docs. D'après les résultats, SharePoint est, dans l'ensemble, l'outil de collaboration le plus approprié. Cependant, selon les utilisations/objectifs précis souhaités, il se peut qu'un autre outil soit plus approprié. Dès qu'un certain nombre d'outils aura été évalué, il sera possible de choisir des outils précis pour des utilisations/objectifs précis en fonction de leur résultat.

Nous pouvons cerner les possibilités en recherche et développement à l'aide de la matrice d'évaluation en regardant les résultats relativement aux exigences et en regardant ceux pour les utilisations/objectifs. Par exemple, la mise en place d'une base de données interrogeable et inscriptible avec des classes réutilisables est une exigence non satisfaite. Les catégories de « simulation/démonstration » et de « développement de réseau » sont des exemples d'utilisations/objectifs non satisfaits.

Un certain nombre de changements sont proposés pour la matrice d'évaluation qui a été créée pour mieux tenir compte des commentaires faits à propos de jugements particuliers. D'autres changements sont proposés en ce qui concerne le système de pointage afin de permettre des comparaisons directes entre les différents résultats.

Les auteurs croient que ce projet a constitué une importante première étape vers le soutien technologique des équipes de planification et d'ingénierie réparties.

Lamoureux, T.L et Rehak, L.A. 2007. Review of Collaborative Tools for Planning and Engineering. RDDC Ottawa CR 2007-206. R & D pour la défense Canada – Ottawa.

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List of Acronyms

AC	Audio Conferencing
CE	Capability Engineering
CFEC	Canadian Forces Experimentation Centre
COTS	Commercial off the Shelf
DAR	Director of Air Requirements
DIS	Distributed Interactive Simulation
DMSO	Defence Modelling and Simulation Office
DND	Department of National Defence
DRDC	Defence Research and Development Canada
FAD	Federation Agreement Document
FCT	Federation Composition Tool
FEDEP	Federation Development and Execution Process
FEPW	Federation Exercise Planning Workbook
FFSE	Future Forces Synthetic Environments
FOM	Federate Object Model
HLA	High Level Architecture
IP	Internet Protocol
inc	Including
M&S	Modelling and Simulation
OMDT	Object Model Development Tool
PDA	Personal Digital Assistant
POC	Point of Contact
R&D	Research and Development
RTI	Runtime Infrastructure
SA	Situational Awareness
SE	Synthetic Environment
SEDEP	Synthetic Environment Development and Exploitation Process
SEDP	Environment Development Plan
SMART	Simulation and Modelling for Acquisition, Rehearsal and Training
SME	Subject Matter Expert
VoIP	Voice Over Internet Protocol
VTC	Video Teleconferencing

1 Introduction

The DRDC Ottawa Future Forces Synthetic Environments (FFSE) section has been established to provide a Research and Development (R&D) centre of excellence in the area of Synthetic Environments (SE) and Capability Engineering (CE). In their fullest application, these fields are broad, wide reaching and interact with a significant number of activities conducted by many R&D groups in DRDC and at other organizations. Through this interaction, a number of 'gaps' emerge that demand additional exploration and development; one such area of increasing interest is the role of collaborative environments in supporting SE-based exercises and experiments.

Discussions with potential section clients have lead to a survey of current collaborative planning and engineering tools given the importance of Collaborative Engineering. The overall objective is to study and develop requirements of a collaborative environment that would be exploited in the development of SE-based exercises and events to facilitate collaboration and data sharing during SE development. The collaborative environment tools will be used to assist in the definition, development, coordination, deployment, use and maintenance of modeling and simulation (M&S) capabilities. To support these objectives, end-user requirements must be sufficiently defined, categorized and compared to various available collaborative planning tools. Additionally, these requirements should be prioritized (if practical) and used to develop a series of evaluation metrics that could be employed to characterize sufficiency of the various tools in achieving end-user requirements.

1.1 Objectives

The objectives of this work are two-fold:

- Survey the marketplace for available tools that may provide collaborative environments to support SE-based exercises and experiments, and evaluate the most relevant candidates;
- Develop an evaluation method for assessing collaborative planning and engineering tools.

These objectives were supported by a number of other discrete activities, such as literature review, interviews, and prioritisation of requirements.

1.2 Contract Authority

This work was performed under contract W7714-04900/001/SV. The Technical Authority for this contract is Dr Chris Helleur. The Project Authority for this work is Dr Wayne Robbins, and the Scientific Authority for this work is Dr Paul Hubbard.

1.3 Report Organisation

This report first includes a brief introduction to the outcome of this project (called the Evaluation Matrix). Detailed methodology information about the conduction of a literature review and subject matter expert (SME) interviews follows. Next, the development of the evaluation tool is described. Then, the reader is provided with instructions about how to use the evaluation tool, including five worked examples (representing the most common and most likely collaborative

environments to be used by FFSE). This section also explains how to use the tool to identify R&D needs. Finally, conclusions and recommendations are made. These include outlining the most appropriate collaborative environment reviewed.

2 Brief Introduction to the Evaluation Matrix

A brief summary of the outcome of the project (the evaluation matrix) is presented in this section. It is thought that by providing this information up front, the detailed project particulars will be more easily understood.

The general principle of this work was that users of collaborative planning and engineering tools would have specific uses for the tools or goals for the tools known prior to tool selection (e.g. Communication and/or Design). Further, specific requirements would be desired of the tools (e.g. Usable) where only a subset of requirements would be applicable to each use/goal. Thus the main thrust of the project was to identify these 'Uses/Goals' and 'Requirements'. The team attempted to maximise the orthogonality between the uses/goals and the requirements; that is, they attempted to ensure that the uses/goals and requirements were as distinct from each other as possible.

This led to the creation of the Evaluation Matrix with the 'Uses/Goals' down the left (vertical axis) and the 'Requirements' along the top (horizontal axis) shown below in Figure 1. Particulars about the creation of the matrix, definitions of the terms in the matrix, the application of the matrix in tool evaluation, and further uses for the Evaluation Matrix can be found in the following sections of the report.

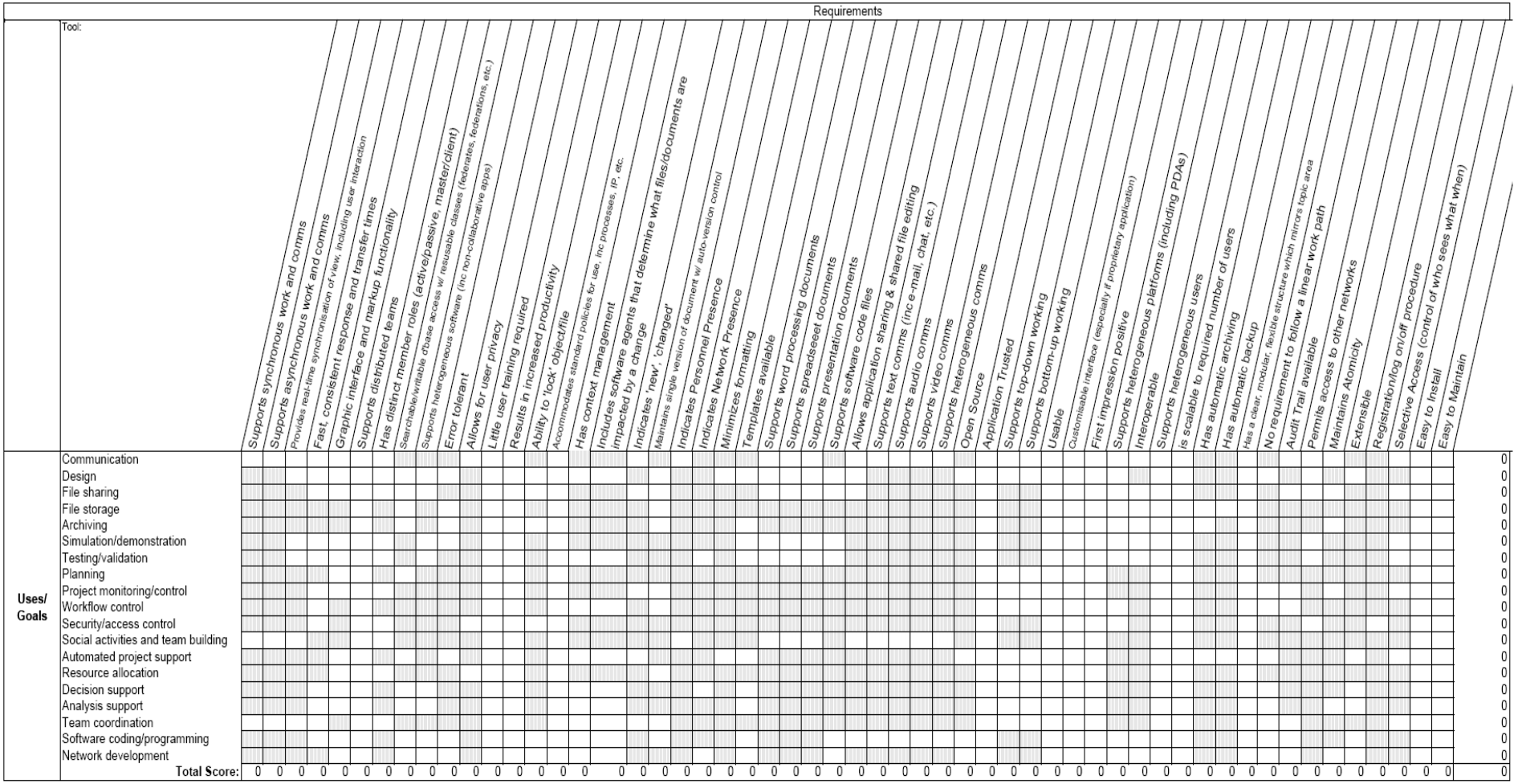

Figure 1: Evaluation Matrix

3 Literature Review

The first step in the project was to conduct a literature review. We developed a set of keywords (see Table 1) for the literature search based on our experience with the pertinent scientific/psychological, human factors, and military domains during a brainstorming session with all members of the literature review team. These keywords were chosen because they focused the search on topics directly related to distributed team collaboration activity and were intended to be able to identify any other related theoretical approaches or conceptualizations that might be relevant.

Table 1: Keywords Used for Literature Search

Core Concept	Primary Keywords	Related Keywords
Distributed	Simulat*, Technic*, Collab*, Environment	Problem, Tools, Coordinat*
Collaborat*	Distributed, Coordinat*, Decision Mak*, Problem Solv*, Computer Supported Collaborative Work (CSCW), Online	
FEDEP	FEDEP, SEDEP	

The primary keywords were the most important words used in the search, as they represented the broad relevant constructs likely to be of importance in research. The primary keywords were used to ensure sampling of literature from several different areas within the core construct, and their use was guided by what emerged from the core concepts. For example, when thinking about the concept of "collaboration", primary keywords such as "distributed", "coordinate", and "online" emerged. Related keywords were used when the primary keyword search resulted in too many potential articles. Related keywords would narrow the search within the output.

The asterisk (*) was used as a special character to represents any other characters, so as to not limit search terms. For example, a search for "coordinat*" includes searching for coordinate, coordination, coordinates, coordinating, and any other term that begins with "coordinat".

3.1 Databases

The primary databases were the most relevant for searching the scientific/academic literature are outlined in Table 2 below.

The literature review thus focused on finding the reported 'uses/goals' of collaborative planning and engineering tools, as well as the associated 'requirements' of users. The reader should note that requirements are focused on supporting human interaction and not detailed technical issues.

Documents were selected for review on the basis of their relevance to distributed collaborative planning and engineering. This immediately rendered many documents less relevant as they focused on face-to-face collaboration or collaboration for other purposes.

Table 2: Primary Databases for Scientific/Academic Search

Database	Description
PsycINFO	The PsycINFO database is a collection of electronically stored bibliographic references, often with abstracts or summaries, to psychological literature from the 1800s to the present. The available literature includes material published in 50 countries, but is all presented in English. Books and chapters published worldwide are also covered in the database, as well as technical reports and dissertations from the last several decades. A login/membership is required to access. http://www.apa.org/psycinfo/
HFES	Human Factors and Ergonomics Society's mission is to promote the discovery and exchange of knowledge concerning the characteristics of human beings that are applicable to the design of systems and devices of all kinds. A login/membership is required to access the articles. http://www.hfes.org/
WWW	A general search of the World Wide Web, mainly through Google and Google Scholar. http://www.google.ca

3.2 Identifying 'Uses/Goals'

Each document selected for review was considered for what the users were trying to do via collaborative means. For example, many papers dealt with shared document editing. Others dealt with the problem of collaborative planning and subsequent sharing of planning information to remote members of the team. This provided an initial list of 'uses/goals' for consideration.

In some senses, identifying the reason for using a tool was the easiest part of the task, as it was usually clear what the authors were attempting to achieve. This information was generally provided in a high level introduction to the paper intended to provide context for the reader.

Identified uses/goals were considered for their relationship to each other and to requirements.

3.3 Identifying 'Requirements'

Identifying the 'requirements' for collaborative planning and engineering tools proved more difficult. Usually, outlining requirements was not the primary purpose of the literature reviewed and the reader was forced to 'abstract' requirements from authors' discussions.

General rules for identifying requirements were developed and used by members of the project team. These rules were:

- A requirement must facilitate goal achievement;
- A requirement must be desirable on the part of the user; and
- Requirements need not be specific to a single use/goal, but must relate to at least one use/goal.

The initial identification of requirements was not restricted (beyond the rules above) so many requirements overlapped with each other, and with the uses/goals. This meant that, when developing and trialling the evaluation matrix, many requirements were combined or eliminated.

3.4 Literature Found and Reviewed

A large number of papers (greater than 60) were reviewed for this project. However, after reviewing the papers, it was decided that only 35 were directly relevant to this work. Accordingly, these 35 papers are presented in Annex A. Due to the fact that the number of papers reviewed exceeded the number for which was budgeted, we focused our review only on the uses/goals outlined in the paper, the requirements described by the paper and the tools reported therein.

3.5 Tools Identified

Similar to the search for uses/goals, each document selected for review was considered for the tools described therein that supported collaborative planning and engineering. Often these might be a loose collection of common business applications such as e-mail and word processors. However, there were also a number of specifically-designed tools which exist specifically to support collaborative work between geographically distributed teams. This provided an initial list of tools.

The list of tools was then added to using the Internet Google search engine looking for tools to support collaborative planning and engineering functions. This search in particular used the terms 'FEDEP' and 'SEDEP'. This led to discovering the richest source of tools and tool descriptions that appear on the resulting list, which was the Wikipedia online encyclopaedia (http://www.wikipedia.org/wiki/List_of_collaborative_software).

A total of 215 tools were uncovered during the course of this project. The tools are listed and described in Annex B, along with information about whether they support the FEDEP and whether they are open source.

A number of tools were identified that were relevant to the FEDEP. However, most collaborative tools are focused on collaboration for crisis management. Further to this, a large pan-European project (EUCLID) was focused on the FEDEP specifically, but took a process-view, rather than a collaborative-tool-support-view. As such, though effective EUCLID tools were developed, they focused on the technical side, and did not necessarily include how goals of users interacted with tool technology. As such, we feel that the aim of the current project, to investigate collaborative tools specifically for planning and engineering of distributed simulation activities, is timely and is not replicated elsewhere in the world.

4 Subject Matter Expert (SME) Interviews

Immediately following the literature review, Subject Matter Experts (SMEs) were interviewed for the project. At the start-up meeting with the Project and the Scientific Authorities, stakeholder groups that should be interviewed and the specific points of contact within these groups were identified. This list represented contacts already held by the Project and Scientific Authorities, as well as those suggested by the contractor. A total of 12 interviews were conducted.

4.1 Interview Participants

The interview subjects and their affiliations are as follows:

- Dr Phil Farrell – Canadian Forces Experimentation Centre (CFEC)
- Bob Elliot – Head of Synthetic Environment Coordination Centre (SECO)
- Capt Pete Dietert, Capt Ray Dean & Mr Bob Kirk – DAR 7-3-2
- Major Scott Arbuthnott – Synthetic Environment Coordination Office (SECO), CF Air Warfare Centre
- Kendall Wheaton – Canadian Forces Experimentation Centre (CFEC)
- Warner Montiero – WaveRate Communications Corporation
- Doug Brown and Norm Green – Army Simulation Centre (Calian Contractors)
- Mike Lepard – Synthetic Environment Research Facility, DRDC Toronto (CAE Professional Services Contractor)
- Dr Rick Bodner – Simulation and Modelling for Acquisition, Rehearsal and Training (SMART) Section, DRDC Toronto

Eleven interviews were conducted face-to-face following the semi-structured interview format outlined below. One interview was conducted by email.

4.2 Standard Questions

The semi-structured interview centred on a number of ‘standard’ (i.e. asked of every participant) questions. These questions were selected to facilitate responses from Subject Matter Experts (SMEs) if they were not available to meet and be interviewed. However, when a face-to-face interview took place, the conversation was permitted to range freely, and the interviewer made sure to get the critical information outlined in the standard questions.

The standard questions were:

- What tasks associated with preparing/developing a distributed simulation do you currently, or would you find useful to, perform collaboratively with a distributed/remote team?

- What type of tool (general functionality or specific brand name) do you feel would enhance your ability to perform these tasks?

- In working collaboratively with a distributed team to stage a distributed simulation, what problems do you typically encounter?

- What tools do you find useful in eliminating problems? (e.g. software, phone, e-mail, etc.)

- What tools exist that you think would be useful enhancements to your ability to collaborate with remote team members?

- What capabilities do you think need to be fielded to enhance your ability to collaborate with remote team members?

- For each capability that you have identified, what are the specific requirements associated with that capability?

- With specific reference to the FEDEP, what problems do you find when your distributed team attempts to run the FEDEP?

- How could these problems with running the FEDEP be overcome?

Interviews were recorded (with participants' permission) and key points were summarized for inclusion in this report (the next section). Note that no new tools were mentioned during the interviews that were not already included on the Tool List (Annex B).

4.3 Results of the SME Interviews

The following sections outline a general summary of what was stated during the interviews. Note that the statements in the rest of this section are only the opinions of individuals interviewed. These views have not been verified for accuracy, nor are the statements necessarily shared by all who were interviewed.

4.3.1 SMEs: General Comments

There are a number of requirements that are very specific to DND applications. In particular, network access may be problematic for some individuals because of the classification of some networks and the location of some individuals. Additionally, there is a need for virtually all DND websites to be bilingual, which may impose significant budget implications of a collaborative environment.

The bulleted list below outlines specific collaboration uses/solutions mentioned by those interviewed:

- A Wiki[1] was proposed as an effective form of collaboration online, but there are a number of technical barriers to overcome. Those with experience with Wiki's find that

[1] "Wiki": A website or similar online resource which allows users to add and edit content collectively. www.parliament.vic.gov.au/sarc/E-Democracy/Final_Report/Glossary.htm

they facilitate the sharing and editing of information very effectively. However, others with limited technical experience may be initially uncomfortable with adding information or editing information currently on the Wiki. With proper training, these initial apprehensions can be overcome. Those interviewed had used Wiki's for technical lists, but not for documents or more tangible instantiations of simulation elements.

- The ability to playback a data logger while discussing the data would be good. This would also be useful in a VTC environment.
- Coordination of resources is difficult. A shared calendar is one way of overcoming this, by showing people's availability to meet and equipment/resource availability for use.
- Bandwidth issues were important. Sharing a large PowerPoint file over a network (especially at the beginning of or during a VTC) imposes unacceptable delays. However, this is in the absence of a common server, which, if everyone could access the server, would allow much greater sharing and reduce delays.
- Perhaps the biggest barrier to tool usage is cultural. People need to have a positive experience otherwise they will not use a tool again. Though technology staff tend to be more adventurous in trying out a new tools, they can also be more uncompromising if something does not work as expected.
- Tools need to be open-source. This allows the technologists involved in the work to modify them to suit the specific needs of the project. Although this is likely to be somewhat uncoordinated, it means that collaborative tools for planning and engineering will be constantly evolving to be relevant to the task at hand.

4.3.2 SMEs: FEDEP Steps and Collaboration

The FEDEP process was roughly followed by those interviewed; however, some sub-steps were perceived to be not required and consequently were skipped. FEDEP steps are not serial, and users can move onto the next step while the previous step is not yet complete (though a user should not be more than 2 steps away from the incomplete step). The following describes some perceptions of the FEDEP expressed during the interviews and how collaboration evolved throughout the process.

4.3.2.1 Step 1 – Define Federation Objectives

This step was done by the project sponsor when the goals of the project were initially outlined.

4.3.2.2 Step 2 – Develop Federation Conceptual Model

The scenario and agreements made were all written and outlined in the Synthetic Environment Development Plan (SEDP). This included a complete description of scenarios, and so forth. at a high level; technologists must then figure out how to achieve what is in the SEDP. The SEDP was effectively the first collaboration tool: a word document describing what everyone should be working toward.

The SEDP was also useful to pass onto new staff to orient them, and others interested in joining, as it clearly outlined what was required. It was also a useful tool to ensure that people are committed to something in full knowledge of what that something is and how it fits into the

broader concept. The SEDP was compact at approximately 30 pages in 4 sections. The SEDP was e-mailed and subject to a VTC discussion and quarterly face-to-face meetings. Online editing of this document would have been useful to facilitate these discussions. Also at this stage, roles and working groups were set up.

The Federation Exercise Planning Workbook (FEPW) is similar to SEDP, though slightly more expansive. It is basically a project folder/plan.

4.3.2.3 Step 3 – Design Federation

Step 3 included many meetings, including quarterly meetings. The SEDP was continually referred to for the purposes of guiding design.

Meetings were structured so that everyone got together and focused on objectives. Then people were split into working groups (6 – 8 people) based on the objectives and steps in SEDP. Typically after a day and a half, the working groups reported on progress made and decided on the actions to be achieved before the next meeting. A great deal of progress was made at meetings, and very little was done in between. Occasionally there was a person working on a part, but nothing particularly substantial.

The distributed project management aspect was challenging, especially as the promise that actions will be reviewed at the next meeting did not provide an incentive to work. The challenge was amplified if the project manager had no direct authority over a group/individual. As such, completing the exercise was largely about personal relationships and individual motivation to do work.

There are also significant differences in culture in terms of authority and choice:

- Army – Need higher approval to do the work. Once approved, will then do it no matter if low personal interest.
- Navy – Need approval by immediate superior to work.
- Air Force – There is more autonomy in deciding what work to do.
- DRDC – May have approval and still may not do the work if not personally interested.

4.3.2.4 Step 4 – Develop Federation

The team eventually got the Federation Object Model (FOM), Federation Agreement Document (FAD) and Runtime Infrastructure (RTI) software and hardware, but the process (via request for proposal) took approximately 6 months. The requirements document developed at this stage was short, but the words were defined carefully, requiring much collaboration and revision. Once the software and hardware was obtained, FEDEP Step 4 began in earnest. At this point, the process became quicker because everyone who needed tools had them.

A great deal of collaboration was needed to get equipment to talk to each other. However, this could be derailed by official requests for new networks and decisions about the classification level of the networks. This led to the conclusion that both a classified and unclassified development environment was needed. SharePoint was used as an unclassified environment collaboration tool, while Wikis and Internet Protocol (IP) phones were used in the classified environments. There was a concern about the use of SharePoint as the tool was not guaranteed to be maintained, however, no alternatives were found and so the tool continued to be used.

Another critical collaboration requirement at this stage of the FEDEP was for a contact list to know who was doing what and how to contact them.

4.3.2.5 Step 5 – Integrate and Test Federation

Wiki pages were again the primary means of coordinating activities and content. Data could not be sent over the network until a security certificate was obtained, which took a great deal of time. In general, the security considerations of following the FEDEP for DND purposes added significant time to the process; even clearances to perform tests were not received until hours before the event.

An ideal collaborative tool would allow the testing of federates as they are being constructed. This would include good loggers and filters. A nice to have would have also been a network management tool to tell you whether the network is awake on the other side and also to manage (or at least measure) bandwidth issues (e.g. who's using what, so that issues can be sorted out over the telephone).

4.3.2.6 Step 6 – Execute Federation and Prepare Outputs

During execution, the only collaborative planning and engineering tools that were considered for use were video conferencing facilities. However, this was not a classified resource and would thus only have been used for briefing and debriefing. Consequently, they were not used. IP Phones continued to be used throughout execution for technical discussions.

4.3.2.7 Step 7 – Analyse Data and Evaluate Results

The lessons learned from the project, including those pertaining to the FEDEP were posted to a computer's hard drive, but archiving is still being done, as is the taking of corrective actions.

A further deficiency in support to the FEDEP is the lack of something to share conceptual models early in the process. Typically this might be Visio drawings or Mind Manager maps. Mind Manager in particular is useful for developing class networks which can then be easily shared between different people and groups. If nothing else, there should have at least have been a shared repository of data, especially the large files (e.g. terrain).

The process also needs Authoritative Data Sources (i.e. a tag to a file that indicates it is the one to use) and Authoritative Operational References. These will help ensure coordination and realism.

One of the primary problems is that people do not actually know what some of the things in the FEDEP are. For instance, the Federation Object Model (FOM) is a tree structure of objects in the federation, but most people don't know what it is. The FOM is meant to be in XML and should thus be readable by human or machine to describe the objects, attributes, interactions and parameters of interactions. The FOM is important because it decides how federates should work together (mediated by the RunTime Infrastructure (RTI)).

Another problem with the FEDEP is the configuration of documents. The FAD defines agreements on how to set machines (e.g. terrain to use, coordinate system, algorithms, etc.). FEDEP use in Canadian applications lack sufficient use of the FAD, which is not always kept up to date. It can be a critical problem when people are not following the FAD, but it does not actually preclude the running up of a federation.

4.3.2.8 Summary of FEDEP Collaboration Opportunities

Table 3 below summarizes the collaboration opportunities that were noted for each step of the FEDEP in the interviews.

Table 3: Summary of Collaboration Opportunities

FEDEP Step	Collaboration Opportunities Noted During Interviews
1	n/a
2	The SEDP was a word document describing what everyone should be working toward. It was e-mailed and subject to a VTC discussion and quarterly face-to-face meetings. Online editing of this document would have been useful to facilitate these discussions.
3	Many meetings were held, including quarterly meetings. The SEDP was continually referred to for the purposes of guiding design. The distributed project management aspect was challenging.
4	The requirements document developed at this stage was short, but the words were defined carefully, requiring much collaboration and revision. A great deal of collaboration was needed to get equipment to talk to each other, which was complicated due to classification level. Eventually, both a classified and unclassified development environment was created: SharePoint was used as an unclassified environment collaboration tool, while Wikis and IP phones were used in the classified environments. Another critical collaboration requirement at this stage of the FEDEP was for a contact list to know who was doing what and how to contact them.
5	Wiki pages were again the primary means of coordinating activities and content. An ideal collaborative tool would allow the testing of federates as they are being constructed. Would include good loggers and filters. A network management tool would also be nice to have that would tell you whether the network is awake on the other side and that would also manage (or at least measure) bandwidth issues (e.g. who's using what), so that issues can be sorted out over the telephone.
6	During execution, the only collaborative planning and engineering tools that were considered for use were video conferencing facilities. However, this was not a classified resource and would thus only have been used for briefing and debriefing. Consequently, they were not used. IP Phones continued to be used throughout execution for technical discussions.
7	The sharing of conceptual models early in the process (e.g. Visio drawings, or Mind Manager Maps) was desired. At minimal, there should have been a shared repository of data, especially the large files (e.g. terrain). Ideally this is required to be provided by the system architect so that all others involved understand the system at a high level. The process also needs Authoritative Data Sources (i.e. a tag to a file that indicates it is the one to use) and Authoritative Operational References. These will help ensure coordination and realism. The FAD defines agreements on how to set machines and needs to be kept up to date.

Additional comments made during the interviews that were unrelated to the FEDEP, but related to collaboration in general have been provided to the project authorities separate from this report.

5 The Evaluation Matrix

This section details the development of the Evaluation Matrix. It also explains the terms within the matrix, and outlines different applications for it.

5.1 Development of the Evaluation Matrix

The evaluation matrix was intended to serve a number of functions:

- Evaluate tools for collaborative planning and engineering, based on satisfaction of requirements;
- Identify which tools are most adequate across a variety of requirements;
- Identify which tools are most adequate for specific uses or work goals;
- Identify research needs for such tools;
- Assist in the selection of tools to support collaborative planning and engineering; and,
- Guide the development of new tools to support collaborative planning and engineering.

To achieve this, the evaluation matrix must represent the requirements for a tool to support collaborative planning and engineering along one axis, and the uses/goals of such tool use along the other axis. These two axes need to be as independent as possible, which is referred to as 'orthoganality' throughout the rest of the report. When creating each of the different axes, effort was placed on ensuring that if a tool supported a particular use it would not unintentionally be seen to support a number of related requirements. However, the converse need also not be true, such that if a tool satisfied a requirement it did not necessarily fulfill a use/goal.

All uses/goals and all requirements identified from the literature review and the SME interviews were listed on two axes. Then all the requirements were considered for overlap. If two requirements were deemed to refer to the same thing, one was deleted and the wording of the remaining requirement was reconsidered to ensure clarity. If two requirements were similar, but referred to slightly different issues, the combining of the two was considered. If it was decided to do so, the wording was changed to ensure that the resultant requirement accurately reflected the different aspects.

A similar process was undertaken with uses/goals. If two uses/goals were deemed identical, one was deleted, and if two uses/goals were similar they may be combined.

Additionally, further separation was necessitated between uses/goals and requirements as there was initially some overlap between the two categories. Thus, requirements were considered against the uses/goals, and uses/goals were considered against requirements. If a use/goal and requirement were perceived to be similar, a decision was made regarding how to increase the orthogonality. This could be done by reframing the use/goal or the requirement to make it different, or by deleting

one or the other. This was considered on a case by case basis with no priority given to one axis over the other.

Requirements were initially grouped together with other related requirements. These groups changed as various steps were taken to rationalise the requirements and ensure orthogonality with the uses/goals. Requirements were also prioritised on a scale of 1 – 5 (5 being a high priority; 1 being a low priority). The prioritisation was then used to develop a weighted score to allow users of the evaluation matrix to quickly determine what tool was best suited overall, and/or for specific uses/goals.

However, it was also recognised that most requirements were only applicable to a specific few uses/goals. Accordingly, each requirement was considered for its applicability for each use/goal. If it was determined that the requirement was not applicable, the corresponding cell in the evaluation matrix was shaded. This meant that the weighted score must accommodate the fact that some requirement scores would be multiplied by a reduced number of uses/goals, while other requirement scores would be multiplied by the total number of uses/goals. The formula that calculates the score reflects these factors.

The user of the evaluation matrix is therefore only required to evaluate some requirements for some uses/goals. The user can assess the requirement as:

- Satisfied – the tool is fully capable of achieving the 'use/goal' as defined by the 'requirement';
- Partially satisfied – the tool is only partially capable of achieving the 'use/goal' as defined by the 'requirement';
- Not satisfied – the tool is incapable of achieving the 'use/goal' as defined by the 'requirement'; and,
- Unknown – the capability of achieving the 'use/goal' as defined by the 'requirement' is unknown.

To assist the user in appreciating the general trend of the tool in meeting requirements and uses/goals, the evaluation matrix was colour coded according to the assessments above.

- Satisfied – green
- Partially satisfied – white
- Not satisfied – red
- Unknown – yellow

Some requirements are more general and applicable to all uses/goals. These tended to be requirements such as usability, improve productivity, etc. In this case, the requirement was assessed for every use/goal and cannot be applied universally. As such, the user must still consider every requirement discretely for each use/goal.

Having constructed the evaluation matrix, it was then necessary to trial its use. This led to further reductions of requirements and uses/goals. These reductions continued to be based on repetition/overlap and orthogonality, but were also now made on the basis of the utility of the requirement or use/goal. Specifically, a requirement must be perceived to assist in determining what collaborative planning and engineering tool is best, or where the gaps in collaborative capability exist. In the course of a number of trials of the evaluation matrix, the concept of utility led to the reduction in the number of requirements used for evaluation. No uses/goals were discarded at this stage of development.

Due to the number of potential tools uncovered during the course of this review, it was not possible to perform an evaluation of all tools (see full list of tools in Annex B). Instead, only those available tools mentioned in more than one interview were evaluated. These tools are outlined below in Table 4.

Table 4: Tools Evaluated

Name	*Brief Description*	*Provide*
SharePoint	An integrated suite of server capabilities for enterprise search, content management, business process facilitation, simplified information sharing, and enhanced business insight	Microsoft
NetMeeting	VoIP and multi-point videoconferencing client	Microsoft
LiveLink	Web content management solution that enables organizations to create, search and manage content.	Open Text
Groove	Custom peer to peer application for distributed teams that enables the creation of collaboration workspaces	Microsoft
Google Docs	Web-based word processor and spreadsheet application that allows users to create and edit documents and spreadsheets online while collaborating in real-time with other users	Google

5.2 Description of Matrix Components

The evaluation matrix is comprised of 19 uses/goals (see Table 5) and 55 requirements (see Table 6). They are ordered in the table below in terms of relatedness. The various priorities of the requirements (5 being highest priority; 1 being lowest priority) are provided in Table 6. Priorities are based on statements collectively made in the SME interviews.

Table 5: Definitions of the Uses/Goals

Use/Goal	Definition
Communication	Exchange of info in real time via voice, text or other means
Design	Development of ideas describing how a product should look, act, etc.
File sharing	Ability for two or more people to use a file
File storage	Ability to store a file somewhere where all nominated users can access it

Use/Goal	Definition
Archiving	Automatic storage of files as they change so that it is possible to revert to an earlier version of a file if necessary
Simulation/demonstration	Ability to run the product so that local and remote users can see it working and participate/interact with it
Testing/validation	Ability for a product to be tested by local and remote users
Planning	Ability for local and remote users to collaborate to develop an accurate and workable plan
Project monitoring/control	Ability for nominated individual(s) to determine at any time how the project is progressing and exercise control measures
Workflow control	Automatic function by which the system determines project progress and suggests next work item to the next person who logs in to the system
Security/access control	Ability to restrict access to approved individuals
Social activities and team building	Provision of avenues to develop and support team connections beyond strictly project related connections (involves the inherent recognition that these additional connections are a necessary part of a high performing team)
Automated project support	Provision of statistics and reminders that assist project team members to carry out the process assigned and to do so in a timely and effective manner
Resource allocation	Automatic process by which the system decides who has the required skills and assigns new or unfinished tasks accordingly and/or determines who has finished assigned tasks
Decision support	Automatic function by which the system provides data and suggestions to support the project related decision making by the project team
Analysis support	Suite of functions that the project team can use or direct to derive meaningful data about the process or product
Team coordination	Based on the plan (schedule and assignment) will e-mail reminders to team members, remove tasks from assignment when complete, initiate new tasks, show who is involved on same and other tasks, and show relationship between tasks
Software coding/programming	Create software to achieve some desired outcome
Network development	Linking technologies so that separate hardware can 'talk' to each other

Table 6: Definitions and Priorities of the Requirements

Requirement	Priority	Definition
Supports synchronous work and communications	5	Team members can work during same time periods to share and communicate with each other
Supports asynchronous work and communications	5	Team members do not need to be available at the same time to work or communicate
Provides real-time synchronisation of views, including user interactions	5	Remote users can see what other remote users are doing to a file/application as it is done
Fast, consistent response and transfer times	4	No appreciable delay to system response time, in spite of using a network

Requirement	Priority	Definition
Graphic interface and mark-up functionality	4	Changes should be indicated on screen by some sort of colour or symbolic coding
Supports distributed teams	1	Supports teams with members who are not in the same room, building, city, country, etc.
Has distinct member roles (active/passive, master/client)	2	Aids coordination of activities between team members, to avoid confusion and error
Searchable/writable database access with reusable classes (federates, federations, etc.)	1	For FEDEP, team members should be able to write new federates to a database for future reuse, and others should be able to search for entries that might save time and effort in future simulations
Supports heterogeneous software (inc non-collaborative apps)	1	Allows software not constructed as part of the collaborative tool to be incorporated into the working process, without any modification
Error Tolerant	1	If there is a loss of communications, or someone makes an error in their entry, the tool does not refuse to function
Allows for user privacy	1	Permits the activities and/or objects of a user to be hidden from other users
Little user training required	5	The manner in which the tool is used should be immediately apparent to users
Results in increased productivity	5	Self explanatory.
Ability to 'lock' object/file	1	Objects/files should be rendered uneditable to guard against inadvertent and uncoordinated changes to critical elements
Accommodates standard policies for use, inc processes, IP, etc.	5	Tool should allow the user(s) to determine how the tool should be used and should permit rules and restrictions to be built in to the application
Has context management	3	System knows what the user is trying to do and presents options that are related to that use
Includes software agents that determine what files/documents are impacted by a change	4	Helps the user to decide what else needs to be done subsequent to a change
Indicates 'new', 'changed'	5	Either in text, colour or symbolically (or all)
Maintains single version of document w/ auto-version control	5	To save space and bandwidth a single version is maintained, but version control (date, time) allows user to determine whether it is desirable to return to an earlier version
Indicates Personnel Presence	5	Indicate whether a user is online
Indicates Network Presence	5	Indicate whether another network is available for use
Minimizes formatting	4	No/minimum formatting required ensuring no time lost making documents adhere to an organisational standard (especially relevant to new team members)
Templates available	4	Templates can be automatically provided to ensure the content of a document/file/etc is clear
Supports word processing documents	5	Self Explanatory

Requirement	Priority	Definition
Supports spreadsheet documents	5	Self Explanatory
Supports presentation documents	5	Self Explanatory
Supports software code files	5	Self Explanatory
Allows application sharing & shared file editing	5	Allows users to share an application that may only be resident on a single machine, and to share a single version of a file that may only be resident in one place
Supports text communications (including e-mail, chat, etc.)	5	Allows or provides text communications within the application
Supports audio communications	5	Allows or provides audio communications within the application
Supports video communications	2	Allows or provides video communications within the application
Supports heterogeneous communications	2	Allows users to communicate via mixed mode; e.g. one user using text and the other using voice
Open Source	5	The code behind the application should be accessible and editable by anyone
Application trusted	3	Users should trust the application to do what they want it to do
Supports top-down working	3	Permits the user to get an overview first and then obtain detail as desired
Supports bottom-up working	3	Permits the user to obtain detail first and use this anyway they want
Usable	4	The application must be intuitive, clear, concise, 'friendly', etc. to the user population
Customisable interface (especially if proprietary application)	4	Appearance of the application should be customisable to the needs and whims of the user
First impression positive	4	Application should immediately make the user want to use it
Supports heterogeneous platforms (including PDAs) and Operating Systems	1	In general, should support laptops, desktops, Windows OS, Mac OS, Palm OS, Windows CE, Blackberry, Sun, Unix, Linux, etc.
Interoperable	2	All applications and platforms should be able to share all data with no data transformation needed
Supports heterogeneous users	3	Should support the needs of engineers, scientists, administrators, etc.
Is scalable to required number of users	3	Can be used by as few or as many users as required by the project
Has automatic archiving	2	No need for the user to save files nor to record what version of the file it is
Has automatic backup	2	No need to backup to a more secure site files that are already saved
Has a clear, modular, flexible structure which mirrors topic area	1	Organisation of collaborative site should mirror users' mental models of the project
No requirement to follow a linear work path	3	Users should be able to use a desired function at any time, and not be held to perform tasks in a strict order

Requirement	Priority	Definition
Audit Trail available	2	The trail that leads to the current file, configuration, etc. should be clear for auditing, management purposes
Permits access to other networks	1	Allows access to DWAN, building networks, WWW, etc. even though it may be its own discrete network
Maintains Atomicity	2	Related exchanges, separated by time should keep their relationship (i.e. not obscure their relationship)
Extensible	4	The application should support add on extensions to its capabilities, functionality, appearance, etc.
Registration/log on/off procedure	4	To monitor who accessed the application and when, and to support the notion of personnel presence
Selective Access (control of who sees what when)	4	To manage issues surrounding security classification and to avoid a team member setting to work on incomplete guidance documents, etc.
Easy to Install	4	There should be few actions required of the installer
Easy to Maintain	4	There should be few actions required to keep the application running well

Priorities were given a reverse order so that a high priority requirement would result in a high score. Thus a '5' reflects a high priority. As can be seen from Table 6 above, there are:

- 18 requirements at priority '5' (highest)
- 13 requirements at priority '4'
- 7 requirements at priority '3'
- 8 requirements at priority '2'; and
- 9 requirements at priority '1' (lowest)

An evaluation matrix (Figure 1) was used to compare the different tools. The scores for uses/goals were summed, with points being awarded as follows:

- Satisfied – 1
- Partially satisfied – 0.5
- Not satisfied – 0
- Unknown – 0

An overall score was then calculated for each tool equalling the sum of the weighted requirement scores added to the sum of the scores for uses/goals.

5.3 Results

The evaluation matrix was used to evaluate five collaborative tools: SharePoint, NetMeeting, LiveLink, Groove and Google Docs and can be found in Annex C. The analysis was based on information learned about the different tools from the SMEs, and information contained on the tools respective websites. The numbers that resulted are not rounded and are rather large. Emphasis should be placed on the rank and general clumping of values with little emphasis placed on the actual values. Out of a possible high score of 866 463, the overall scores for each tool were:

- SharePoint – 293 182.5
- Groove – 277 104
- Google Docs – 120 664.3
- LiveLink – 114 224
- NetMeeting – 56 375

SharePoint ranked overall as the most appropriate collaborative tool based on this scoring system. However, it is useful to consider the score of each tool for each of the uses/goals. This information is presented in Table 7. The highest score is shaded. Note that the Total Possible (second from the right column) for each of the Uses/Goals are not the same as they vary according to the number and priority of requirements relevant to that Use/Goal (i.e. number of shaded boxes in Figure 1 varies).

Table 7: Tool Scores for Each Use/Goal

Tool	Share Point	Net Meeting	Live Link	Groove	Google Docs	*Total Possible*	*Highest % Satisified*
Communication	27	20	20	24	22.5	*38*	*71%*
Design	24.5	15	10	24	22	*38*	*64%*
File sharing	22.5	15	17	20	19	*32*	*70%*
File storage	13.5	1	10	11	14.5	*20*	*73%*
Archiving	14.5	1	11	11	12.5	*22*	*66%*
Simulation/demonstration	0.5	1	8	10	3	*28*	*36%*
Testing/ validation	0.5	1	13	11	19	*30*	*63%*
Planning	13	8	6	9	0	*17*	*76%*
Project monitoring/control	20	8	9	15	0	*24*	*83%*
Workflow control	15	1	5	12	0	*22*	*68%*
Security/access control	15.5	10.5	8	12	15	*20*	*78%*
Social activities/ team building	18	17.5	14	17	18	*26*	*69%*
Automated project support	20	1	13	18	0	*29*	*69%*
Resource allocation	16.5	1	7	13	0	*19*	*87%*
Decision support	18.5	1	2	13	0	*25*	*74%*
Analysis support	17.5	1	3	12	0	*25*	*70%*
Team coordination	20	1	14	18	0	*27*	*74%*
Software coding/ programming	13	12.5	4	16	19	*35*	*54%*
Network development	1	8.5	2	10	16	*30*	*53%*

The far right column (Highest % Satisified) takes the highest score from each Use/Goal (i.e. the shaded box) and divides it by the Total Possible value to give an idea of how well that Use/Goal is met by the highest scoring tool. Note that there is considerable variance on the level of satisfaction between the tools, often due to some tools' complete lack of support for particular uses/goals.

As can be seen from Table 7, SharePoint has the most 'high scores', followed by Google Docs and then Groove. In spite of this, Groove still scored higher overall than Google Docs, indicating that Google Docs is ranked better for certain uses (e.g. File Storage) but Groove is ranked better overall.

Although the maximum score for each use/goal is variable (according to the number of requirements that are relevant to that use/goal), this information can still be used to identify where research should be focused. For instance, '10' was the highest score for collaborative tools to support 'simulation/demonstration'. The maximum score it could have achieved is '28' assuming all of the relevant requirements were 'Satisfied' which gives the value in the far right column of 36% (i.e. 10/28). This implies two things: (1) that there are not many collaborative tools that support this use/goal; and (2) that of those tools that exist, they do not satisfy the requirements for this use/goal very well. Thus it may be appropriate to say that money and effort should be spent to develop collaborative means to support 'simulation/demonstration'.

5.4 How to Evaluate Tools using the Evaluation Matrix

The use of the evaluation matrix to evaluate tools is fairly straight forward. In the first instance, the evaluator should write a brief description of the tool in cell B1[2]. This description should be enough to tell a reader what the tool is intended to do, and where to go for further information (i.e. a hyperlinked URL).

Assuming the evaluator has used the tool or has enough understanding about the tool (through documentation, marketing material), s/he should then proceed to consider each relevant requirement for each use/goal. Relevant requirements are those cells that are not shaded. There will be more relevant requirements for some uses/goals than for others. It is recommended that the evaluator go through all the requirements (e.g. all columns) for a single use/goal before moving on to the next use/goal (e.g. row) as illustrated in Figure 2 below.

We recognise that, in practice, however, most evaluators are going to fill in blank cells in a hybrid systematic/opportunistic manner. This arises from the fact that the evaluator knows what other uses/goals will be evaluated and cannot help but evaluate more than one when considering a requirement.

For each blank cell, the evaluator must determine whether the requirement is satisfied (Y), not satisfied (N), partially satisfied (P), or unknown (U) as illustrated in Figure 3. For the purposes of our work, if an application did not support a use/goal, we entered 'N' in the spreadsheet, reflecting that the requirement is not addressed but, more importantly, scoring a '0' for that cell.

[2] References to specific cells will be made with respect to the column letter and the row number.

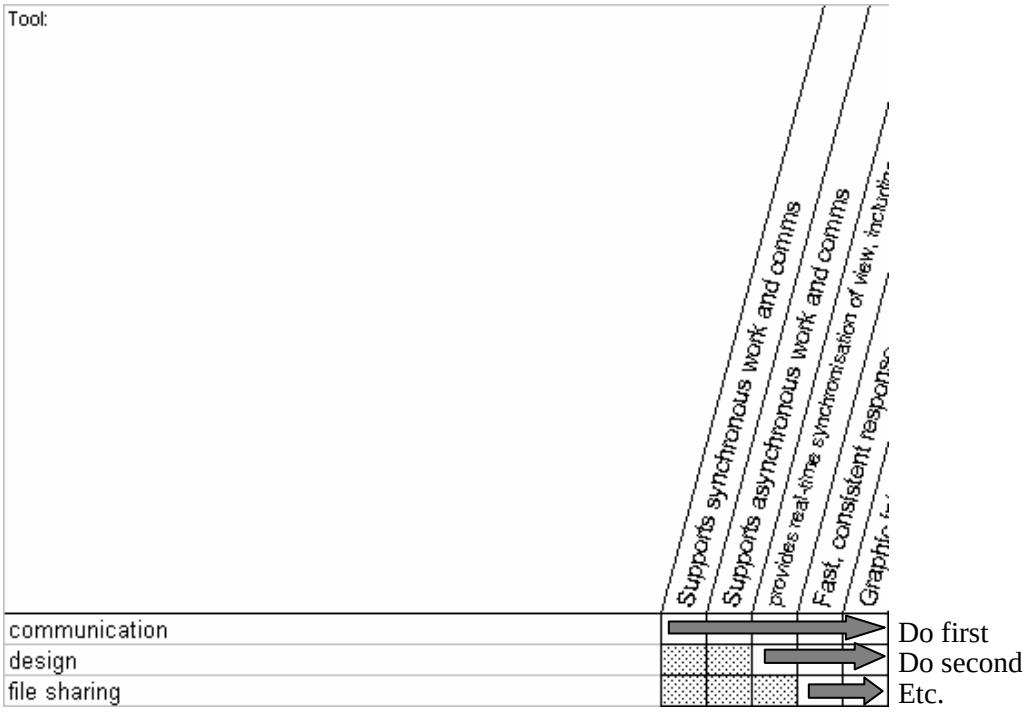

Figure 2: Evaluation Matrix Ideal Order of Entries

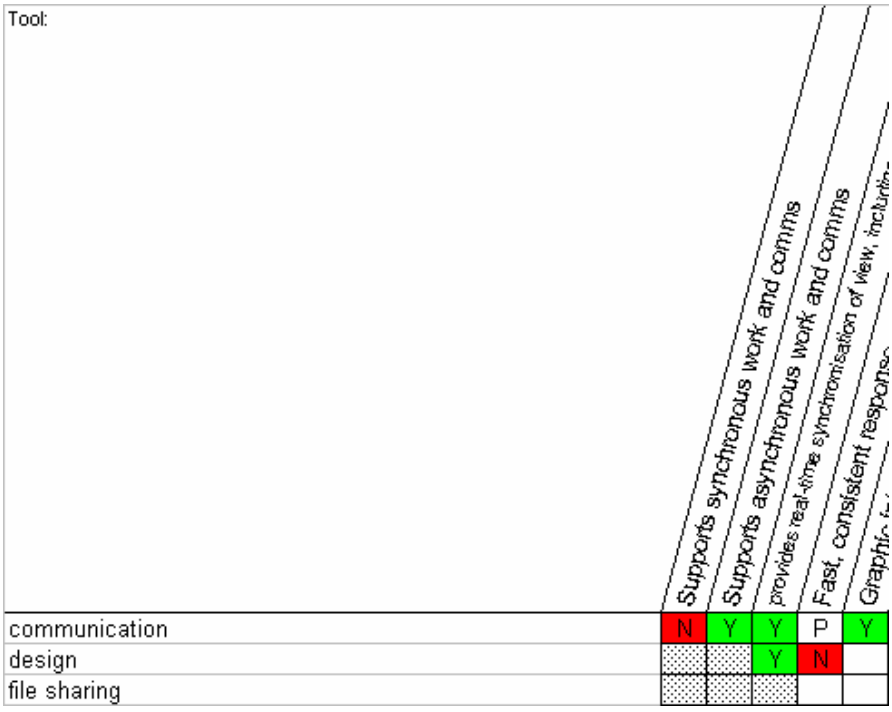

Figure 3: Evaluation Matrix with Partial Entries

If the evaluator enters 'P' (for 'Partially') the evaluator should note down why it is a partial match at the bottom of the spreadsheet for future reference. Due to time constraints, this was not done during this project.

The spreadsheet automatically updates the scores as the evaluator fills in the blank cells. Total scores for each requirement are shown at the bottom of each requirement (row 21), and totals for each use/goal at the far right of each use/goal (column BF). Total score is found in the lower right hand corner (BF21). Thus, immediately upon finishing the evaluation, the evaluator will know how suitable the collaborative tool is for the purpose in mind.

5.5 How to Select Tools for Specific Purposes

Once a number of tools have been evaluated it will then be possible to select specific tools for specific uses/goals, based on their score. This is not meant to imply that the tools are interoperable where a tool ideal for some use/goal makes available relevant information to another tool that is best for another use/goal. Indeed, it is likely that many of the tools listed are actively antagonistic to each other with little to no information sharing across tools. In general, each of the different tools are completely separate systems.

The first step toward selecting the most appropriate tool based on the evaluation matrix is to determine what the tool is meant to support. This may be a single use/goal, but is more likely to be some combination the 19 uses/goals. Having determined what uses/goals the tool should support, it may be necessary to prioritise between them. If the most important uses/goals actually scored low, but the overall sum is raised by high scores for other uses/goals, the then the highest scoring tool may not actually be the best one for that job. For example, referring back to the five tools presented, if the important uses/goals in selecting a collaborative tool for a specific project were 'File Storage' and 'Social Presence and Team Building' then the two highest ranking tools (SharePoint and Groove) appear to be a less effective choice compared to the top ranking tool for those specific use/goals: Google Docs.

Thus, the selection of a tool for a specific purpose is made by considering the sum of scores for the uses/goals of interest, and perhaps the specific score(s) of the highest priority uses/goals.

5.6 How to Identify R&D Requirements

There are two ways that research and development requirements can be identified: (1) by looking at requirement scores; and (2) by looking at use/goal scores.

Requirement scores are variable according to the number of uses to which a requirement applies. However, a reader can get a quick overview from the evaluation matrix of how well a requirement is not met purely from the high concentration of red colour coding in the vertical dimension. Some requirements have been particularly poorly met by all tools evaluated; for example, the provision of a searchable, writable database with reusable classes.

The other way of identifying R&D opportunities is by considering the scores for each use/goal. Again, these scores are variable according the number of times a use/goal was assessed against a requirement. Similarly to the requirements though, the reader can get a quick overview of the need for R&D for uses/goals by looking for blocks of red in the horizontal dimension. This represents a use/goal not meeting the corresponding requirements. Again, an example of two candidates for further R&D are 'simulation/demonstration' and 'network development'.

This tool really only provides the reader with information to help them identify R&D requirements. It is not a decision making tool, and cannot substitute for the decision maker's own understanding of the application domain and the options that exist therein.

5.7 Suggestions to Improve the Evaluation Matrix

The evaluation matrix is undoubtedly daunting to use; however, an iterative process has reduced a bigger list of requirements and uses/goals to the current set. As noted elsewhere, there are 19 uses/goals and 55 requirements, leading to the possibility of filling in 1045 discrete cells. These discrete cells have been further limited by shading cells that were deemed to be inapplicable; however, there are still many judgements to be made and an 'auto-fill' function is not appropriate as there are no multiple cell sets that will necessarily receive the same entry. The authors do not believe it is possible to reduce the number of judgements that need to be made at this time.

It is noted, however, that: (1) the scores that result cannot be directly compared with each other; and (2) the resulting evaluation scores are rather large and cumbersome. It is advisable that each score should be divided by the number cells in that row or column in order to standardise the score. Differences won't be so clear, but direct comparisons will be possible. This normalization process was not done during this project due to time constraints.

Ideally, it would be easier to enter information about 'partial' scores. At the moment the spreadsheet makes not provision to record or store these, without affecting the appearance of the evaluation. The use of 'comments' in the cell itself is one solution.

6 Conclusions and Recommendations

The work reported here identifies a number of tools suitable for collaborative planning and engineering. Further, we have identified a number of user requirements for such tools that would help to ensure that investment in such tools would be beneficial. We have also identified the most likely uses for collaborative planning and engineering tools. This work led to the development of an evaluation matrix for use when assessing such tools. This evaluation matrix can also be used to select which tool to use and to identify R&D requirements, thus leading to more strategic use of available funds to address the most significant problems.

The evaluation matrix has been used to evaluate a number of collaborative tools currently used by DND. Of these, the highest overall score was SharePoint, followed by Groove. These two tools present a single workspace, from which users can 'check out' documents to be worked on. However, they do not provide real-time collaborative working with awareness of the moment-by-moment actions of the collaborators.

It is not recommended that all the tools identified should be evaluated. However, it is recommended that any tool that is proposed for use by DND could be evaluated as a first step to determine whether it provides any significant advantage over the existing capability.

It is also felt that the tool list provided should be considered for which tools may represent improvements on those already used by DND. These tools should be subject to an evaluation to establish their relative merit amongst the tools evaluated for this project.

Pursuant to this, the evaluation matrix should be improved such that it is better able to accommodate comments about specific judgements.

The scoring system incorporated in the evaluation matrix should also be amended to permit direct comparisons between different scores. This would help tool selection and identification of R&D needs.

Further to Canadian efforts, there has been a large research project in Europe investigating the FEDEP (Brassé, Mevassvik, & Skoglund, 2000) and this has resulted in evaluations of a number of tools. A similar effort has been undertaken in the United States (Cowen, 2007), although it focuses on collaborative tools for crisis management. Although useful to inform the Canadian effort, neither of these has resulted in outcomes that can be easily assumed by the Canadian simulation community, largely because the particular application domain. None of the tools investigated by the European and US efforts have been evaluated for this project as the authors decided to only evaluate tools that were mentioned in the SME interviews.

As a result, we feel that this project has provided an important first step toward the technological support of distributed planning and engineering teams. The evaluation matrix can be used to strategically allocate effort and, ultimately, can play an important role in developing a tool that can lead to more effective staging of distributed simulations.

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Annex A: Annotated Bibliography of Literature Reviewed

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
Distributed collaboration for engineering and scientific applications implemented in Habanero, a Java-based environment	Brent Driggers, Jay Alameda, Ken Bishop	Concurrency: Practice and Experience, Vol 9 (11), pp 1269-1277, (November 1997)	Communication (text/chat are good for documenting and archiving, but bad for communications - audio better), voting (to establish operating parameters), reactor design, wind tunnel simulation	Display same material on every computer, synchronisation, determine state of remote computer, create session or join session, become session manager	Habanero, KESI
Madefast: Collaborative engineering over the Internet	Mark R. Cutkosky, Jay M. Tenenbaum, Jay Glicksman	Communications of the ACM, September 1996, 39 (9).	Repository of info	Chronology of meetings and milestones, map of registered participants, top level pages for design process and design artefacts, computer assisted design (CAD) models, notes, test results, calculations, other design information, authoring, document control, document navigation, asynchronous communication, synchronous communication, support heterogenous platforms, scale well in WANs, enable capture of session info, facilitate playback of asynchronous infonavigation, organisation of data/info	MADE (Manufacturing Automation and Design Engineering)
Java's role in distributed collaboration	Marina Chen, James Cowie	Concurrency: Practice and Experience, Vol 9(6), pp 509-519 (June 1997)	Proof of concept demonstrations, testing/validation, planning (process design, partition of collaboration into tasks, specification of public interfaces, binding of interfaces to a publication 'home')	Flexibility, cost constraining, support for large-scale collaborations, raw performance, allows quick POC demos/validations, publish code and documentation in standard format, configuration control, collaboration design, shared name-space management, flow control for links between components, security, resource management, software integration	Java, C++, Tcl/Tk, Perl 5, Standard ML, F77, MPI, F95, HPF, HTML
Media spaces: bringing people together in a video, audio, and computing environment	Sara A. Bly, Steve R. Harrison, Susan Irwin	Communications of the ACM, January, 1993, Vol 36, No 1	Awareness, chance encounters, locating colleagues, video phone conversations (focused, group discussions, recording/replaying video records, project support (experimentation and envisionment), presentations, social activities	Scalability, points of reference (spatial, object, figural [people])	Audio, video, computing, VideoWindow: Bellcore; Cruiser: Bellcore; RAVE: Rank Xerox EuroPARC; CAVECAT/Telepresence:UofT; TeleCollaboration: US West Advanced Technologies; Kasmer: Xerox PARC
DistView: support for building efficient collaborative applications using replicated objects	Atul Prakash, Hyong Sop Shim	Computer supported collaborative work: proceedings of the 1994 ACM conference on computer supported collaborative work, Chapel Hill, NC, pp. 153-164	Export window to group, import window, communication, shared editing,	Ability to share synchronised views of interactions with an application, objective-level replication scheme, efficient, fault-tolerant, allow private application windows in collaborative environment, simultaneous interaction with application, no drop in system response times, equal and adequate performance across WAN, minimal additional effort to turn non-collaborative app into collaborative one, no additional knowledge required on the part of the user to use collaborative app, feedback, chat, identification, synchronisation of actions in shared windows, autoupdate/synchronisation, lock object,	DistView

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
Scenarios as a Tool for Collaborative Envisioning: Using the Case of New Sensor Technologies for Military Urban Operations	Joshua Schoenwald, Stoney Trent, James Tittle, David Woods	Proceedings of the Human Factors and Ergonomics 49th Annual Meeting, 2005.	n/a	Organises large amounts of information, navigation should be a model of the topic being navigated, multi-tiered organisation (3-5 meaningful sections), no required linear path	Topic Landscape - not really relevant to engineering, but interesting for research
Team ergonomics and human engineering methods for the design of collaborative work environments: a case study	Bohan J A, Wallace D F	Proceedings of the Human Factors and Ergonomics 41st annual meeting, 1997.	Picture building in ops centres	Enables direct communication, supports tasks to be performed, enables efficient and accurate acquisition of required information	n/a
Collaborative Logistics: Developing a Framework to Evaluate Socio-Technical Issues in Logistic-Based Networks	Joseph Lyons, Jill Ritter, Krystal Thomas, Laura Militello, Patrick Vincent	Collaborative Technologies and Systems, 2006. CTS 2006. International Symposium on. May 2006. pp 208- 214	Distributed adaptive logistics/sense and respond logistics/knowledge enabled logistics	Speed, robustness, evaluation metrics, address socio-technical factors, compensate for loss of socio-emotional cues, facilitate trust-building between team members, foster team cohesion, avoid local coalitions, positive leadership	E-mail, phone, video conference, instant messaging
Internet-Based Collaborative Virtual Simulations with Area of Interest Management	A. Diabi, S. Shirmo-hammadi, A. Gillmore, P. Lacombe, J. C. de Oliveira	Collaborative Technologies and Systems, 2006. CTS 2006. International Symposium on. May 2006. pp 200- 207	Mainly for use during simulations, not in the lead up to a simulations - mostly about overcoming bandwidth/latency restrictions	End to end delay of less than 100 (or 200) ms, scalability, accurate and regular state information	IP Multicast, Application Layer Multicasting (ALM), Area of Interest Management (AoIM)
Awareness-Enabled Coordination for Large Scale Collaboration Management	Dimitrios Georgako-poulos, Marian Nodine, Donald Baker, Andrzej Cichocki,	Collaborative Technologies and Systems, 2006. CTS 2006. International Symposium on. May 2006. pp 132- 141	Homeland security, intelligence gathering	Support many users, support single users, support teams, increase efficiency, context management, contextualisation, team coordination, process automation, policy enforcement, situational awareness, team awareness, permit dynamic change/adaptation, reduces environment presented to user (context mgmt)	Awareness-enabled coordination
Specifying Agent Support for Collaboration	Igor Hawry-szkiewycz,	Proceedings of the International Symposium on Collaborative Technologies and Systems. 2006. pp 109 - 116	Agents to encourage technologically mediated collaborative support	Contextual dynamic facilitation by software agents, agents that 'read' files when they change and determine the impact and change other things accordingly, accommodates activities and work items, work processes (including events and workflows), and social structures, different agents (Activity, Work-Action, Role, Group, Personal, Artifact, Connect (Broker), Coordination), support perception, reasoning and action	E-mail, SMS, visual displays, web portals, blogs, file systems, discussion systems, workflow systems, calendar systems, group calendars, shared whiteboards, workspaces for asynchronous support, interactive visual displays and workspaces

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
VO-based Dynamic Security Associations in Collaborative Grid Environment	Yuri Demchenko, Cees de Laat, Vincenzo Ciaschini, Valerio Venturi	Proceedings of the International Symposium on Collaborative Technologies and Systems. 2006. pp 38-47	managing dynamic security associations and complex resource provisioning	dynamic trust management, span multiple trust domains, handle different user identities and attributes, etc., attributes and metadata resolution and mapping, policy combination and aggregation, flexible management infrastructure, registration procedure, security policy, acceptable use policy	n/a
A Longitudinal Study of the Use of a Collaboration Tool: A Breadth and Depth Analysis	Jean Scholtz, Emile Morse, Michelle Potts Steves	Proceedings of the International Symposium on Collaborative Technologies and Systems. 2006. pp 1-11	share files, manage projects, create solutions, chat,	No additional overhead associated with using the system, awareness of who is online, who is a member, network management issues, should assist (not hinder) decision making, synchronous and asynchronous working, text chat, audio chat, net meeting, designation of 'new' or 'changed', access role, value-added, overheads to utilisation, impacts on individuals, metrics (did adhoc collaboration increase, did tool support collaboration, how did work process change, how did work products change), no time to synchronise space	Groove (file sharing, basic collaboration, calendar, sketch pad, note pad, forms tools project planning tool, meeting space support tool, collaborative browser - all compatible with MS Office tool suite)
Collaboration Entities on Deterministic Finite Automata	Minjun Wang, Geoffrey Fox, Marlon Pierce	Proceedings of the International Symposium on Collaborative Technologies and Systems. 2006. pp 26-37	Shared presentation editing	Master/client active/passive relationship, synchronised views	Powerpoint, Impress, ReviewPlus
WORKPAD: an Adaptive Peer-to-Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/Disaster Scenarios	Massimo Mecella, Michele Angelaccio, Alenka Krek, Tiziana Catarci	Collaborative Technologies and Systems, 2006. CTS 2006. International Symposium on. May 2006. pp 173- 180	Disaster response, short term recovery (software and communication)	Peer-to-peer architecture, novel techniques for knowledge content integration, novel adaptive techniques for cooperative work and workflow management, geo-referenced information, devising safety and security solutions for emergency communications, threat detection and management, wireless communications and back end networks, geo-collaboration	WORKPAD, content management systems (CMS) middleware (but doesn't say what)
Cooperative environments for distributed: the distributed systems environment report	B. Baurens, P. Chilaev, V. Krivtsov, V. Volochinov	Springer Lecture Notes In Computer Science Series , Cooperative environments for distributed: the distributed systems environment report. 2002. pp 7 - 13	n/a	n/a	n/a

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
Collaborative Engineering Enterprise	Suleyman Guleyupoglu	Extensible Modeling and Simulation Framework (XMSF) Technical Opportunities Workshop. https://www.movesinstitute.org/xmsf/workshop/guleyupoglu/guleyupogluXmsfPointPaper.pdf.	Simulation-Based Acquisition, information sharing and decision support by discussing, analysing, and iterating all aspects of system design by using shared information, models and applications	Scalable client-server architecture, multiple platforms (including PDAs), asynchronous availability of information, supports project management by tracking and monitoring tasks, provides tools to help define tasks in collaboration, create virtual enterprise via persistent virtual space, support virtual personal office, provide framework for intergrating simulations and diverse collaborative activities, enhance productivity, generate products, faster, automation, integration, multiple individuals working on same work process flow concurrently, low bandwidth VOIP, commercial off the shelf (COTS) collaboration tool integration (e.g. remote conferencing), configuration control implantation for the repository	n/a
Communication Framework for XMSF	Dr. Norbert Schiffner	https://www.movesinstitute.org/xmsf/workshop/schiffner/CommunicationFrameworkForXMSF.pdf	Share media across a network among two or more workstations, more than one person at a time can generate, process, represent and store info	Consistency of distributed data (maintenance of atomicity, first-in first-out ordering, causality preservation), efficient session management (floor control, session control), network as a 'black box', heterogeneity of users, heterogeneity of hardware, heterogeneity of software, heterogeneity of communication, interoperability, flexibility, extensibility, scalability (one to one, one to many, many to many), Ergonomy, usability, customizability of interface, modular architecture, reusable classes, modules/libraries, executable components, frameworks, reliable, robust, efficient	HOUCOM
Federation Composition Process and Tool Support in EUCLID RTP 11.13	Marco Brassé; Ole Martin Mevassvik; Tom Skoglund	TNO (Netherlands) and FFI (Norwegian Defence Organization), 2000.	Design federation, implement federation, selection of simulation assets and composition of these assets into a working HLA federation, control work flow by guiding user through SEDEP process step by step: 1. federation system spec is processed and presented to the user; 2. User develops federation architecture (iterative - decide on number and type (simple/complex) of federates); 3. User details required federate capabilities (maintains links between design and federate capabilities); 4. User formulates repository queries; 5. User selects simulation assets; 6. User supported by FCT in assessing candidate simulation assets; 7. User documents design decisions	Process-oriented, tool-oriented, searching asset repository, asset characterisation, federation conceptual model, scenario, requirements (scenario and assets), asset reuse, distributed asset repository, asset characterisation method, component based architecture design, SEDEP-wide integrated tool set, Federation system specification (federation scenario, federation conceptual model, federation system requirements), federation design specification, identification of federation bridges, selection of federates, FOM (interface contract between federates), federation agreement (documenting inter-operability decisions not covered by the FOM) - technical agreements (federation initialisation mechanism, management procedure, database/coordinate system specs, data collection agreements, algorithms for 'fair fight' conditions) resource agreements (availability of resources, sharing of (restricted) data) project specific agreements (commercial licenses, demonstration agreements), complex federates (composed of functional building blocks - customisable, reusable, secure, high performance), agreement matrix, supports top-down and bottom-up federation composition	Federation Composition Tool (FCT)

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
Recommen- dations for Conducting Real-time Human-in-the-Loop Simulations over the Internet	Thomas Z. Strybel1, Riva Canton, Vernol Battiste, Walter Johnson, Kim-Phuong L. Vu1	Proceedings of the Human Factors and Ergonomics Society 50th Annual Meeting, San Francisco, CA. 2006.	Procedural recommendations: 1. Establish an audio and visual communication link for developers, experimenters and test pilots that is fast and reliable; 2. Create and maintain a digital repository of simulation software, paper forms and data files used in the simulation (i.e. an FTP or Website, responsibility for maintenance clearly identified, this ensures that all sites configured with latest software versions, possibly a central hard drive image stored here); 3. Establish a formal readiness procedure that will determine when the simulation is ready for test participants (would also determine when to freeze simulation so that pilot and experimenter training could commence)	Simulation Experimental Design Recommendations: Control and assess differences in performance between sites - don't want to confound simulation location with participant performance. In experiment, they tested pilots at one location then did experiment at another site. 1 pilot performed worse than other 3, but can't say cause. Design Suggestions: Talk/View others, Digital repository of: software, paper forms, data files; Straightforward approach to knowing when simulation is ready for test, Audio/Video link, FTP site or Website, maintainer explicitly identified, Formal readiness procedure	n/a
Argo: a system for distributed collaboration	H. Gajewska; J. Kistler; M. Manasse; D. Redell	ACM Multimedia. 2004.	Know who is doing what, mobility	Video, Application sharing, Tele-pointing, telepainting (different colour for each user), teleportation (can log in from any location and get same system look/feel)	Argo, DiCE, ShowMe, ABC (all very old) Shared X (proxy server), Trestle (supports window replication) and Mbone Applications (e.g. wb - a groupware). Other tools being developed are Sun's ShowMe, DiCE, ABC.
Distributed Collaborative Environments for 21st Century Modeling & Simulation	William K. McQuay	http://www.modelingandsimulation.org/text/McQuay.html	Simultaneously view/discuss/edit docs, allow uses to track progress of tasks/documents (versioning)	Access to docs, maintain docs, auto notification of updates, synchronous connectability to docs, monitor progress of tasks, versioning	n/a
Collaboration with Ecological Interface Design	Catherine Burns, Angela Garabet	Proceedings of the 48th Annual Meeting of the Human Factors and Ergonomics Society, 543-546. 2004.	Used Microsoft NetMeeting 3.0	n/a	NetMeeting 3.0

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
User-Centered Evaluation of Multinational Communication and Collaborative Technologies in a Network-Centric Air Battle Management Environment	Robert Bolia, Anna Langhorne, W. Todd Nelson, Michael Vidulich	Proceedings of the Human Factors and Ergonomics Society 48th Annual Meeting (pp. 731-735). Santa Monica, CA: Human Factors and Ergonomics Society.	Top 4 rated technologies: Data Capture and Replay, Chat and messaging, Data Visualization Tools, File and Application Transfer. Bottom 4 rated: Opinion Polling, Automated Decision Support, Large Shared Displays, and Virtual Whiteboard. Neither top nor bottom: Interactive Intelligent Agents, Video Teleconferencing (VTC), Broadcasts and Alerts, Expertise/Knowledge locations, Automated Workflow. Rated by USAF, USN and RAAF in terms of Air battle management work domain, through filling out Collaborative Interface Technology Survey developed for the study.	Data Capture and Replay, Chat and messaging, Data Visualization Tools, File and Application Transfer Bottom 4 rated: Opinion Polling, Automated Decision Support, Large Shared Displays, and Virtual Whiteboard. Neither top nor bottom: Interactive Intelligent Agents, Video Teleconferencing (VTC), Broadcasts and Alerts, Expertise/Knowledge locations, Automated Workflow.	Top 4 req'ts: ways to capture data, Realtime text exchange, shared visuals, file sharing
Collaborative Tools and Shared Mental Models	Cheryl Bolstad, Cleotilde Gonzalez, John Graham, Mike Schneider	Proceeding of the Human Factors & Ergonomics Society, 48th Annual Meeting, New Orleans, LA. 2004.	Face-to-face, Video Conferencing, Audio Conferencing, telephone, networked radio, chat/IM, white board, file transfer, program sharing, email, groupware, bulletin board, domain specific tools Collaborative processes: planning, scheduling, tracking information, brainstorming, document creation, data gathering, data distribution, shared situational awareness (SA)	Time of collaboration (synchronous or asynchronous), predictability of collaboration, place of collaboration (co-loc or dist), degree of interaction. Also, characteristics of tools: recordable/traceable (necessary for good SA), identifiable (if individuals using tools are easily identified - good for team formation and shared SA), structured (specific communications only vs. variety of info types allowed. Info types: verbal, text, spatial/graphical, emotional (fatigue, workload, competence, anxiety, etc), photographic, video	n/a
A Field Study of Collaborative Work in Network Management: Implications for Interface Design	Rene Chow, Kim J. Vicente	Proceeding of the Human Factors & Ergonomics Society pp 356-360, 2001.	Database of service requests; voice communication	Need eyes/hands for investigating issues at remote locations, change managers (map out plans to add/remove/replace hardware)	Phone (coordinated with voicemail, pagers) and Email
Collaboration Effects on Distributed Student Team Performance	M.E. Reichert, A.L. Williams, C.M. Harvey	Proceeding of the Human Factors & Ergonomics Society. 2001, Vol 1, pp 763-767	5 variables looked at: Team Organization (how teams distributed work and set deadlines), correlated with grade Team Co-ordination (how teams adapted and worked with one another), was fundamental to team performance. Team Interaction, Team Leadership, and Team Cohesion were not discussed (hence assumed no correlation).	n/a	n/a

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
PRESTO: multimedia distributed network for collaborative work in command and control	J. A. Modrick	Proceeding of the Human Factors & Ergonomics Society, 40th Annual Meeting. 1996.	Captures essence/dynamics of collaboration session; maintain cohesion within group	Define and manage shared context	n/a
Building Scalable and high efficient Java Multimedia Collaboration	Wenjun Wu, Tao Huang, Geoffrey Fox	Proceedings of the International Symposium on Collaborative Technologies and Systems. 2006. pp 18-25	n/a	n/a	Global-MMCS is main tool in article. Other tools mentioned are: Java Collaborative Environment (JCE, developed by NIST); Java Enabled Tele-collaboration (JETS, from Univ. of Ottawa). Apple's QuickTime is primary technology used to support video.
Collaboration and Community Grids	Geoffrey Fox	Proceedings of the International Symposium on Collaborative Technologies and Systems/ 2006. pp 419-428	See/hear others; editable exchanges of text; audio/video exchange; bulletin boards, list serves, Wikis	Synchronous and asynchronous communications;	Skype, Wiki pages.
Federation Development and Execution Process (FEDEP) Tools in Support of NATO Modelling & Simulation	Turrel, Christopher; Brown, Rick; Igarza, Jean-Louis; Pixius, Kay; Renda, Fernando	NATO Research and Technology Organization Neuilly-sur-Seine, France. 2004.	List of NATO Fedep Tools.	n/a	A long list of tools were in this report and can be found in the list of tools in Annex B.
The Impact of Microsoft's Unified Communications Launch	Zeus Kerravala	Enterprise Computing and Networking, August 2006.	Desktop video, pager, email, mobile phone, collaborative software, web conferencing, fax, voicemail, audio conferencing, laptop, phone, room-based video, messenging software, PDA	IP network, IP telephone/VoIP, Desktop Software, Mobility (ability to replicate user experience no matter where they are), Security, Presence Information (ability for users to understand another user's availability and willingness to communicate)	n/a
A Review of Team Collaboration Tools Used In the Military and Government	Seymour Cowen	Office of Naval Research and SPAWAR. 2007.	Blogs, bluetooth, sms/mms (mentioned, though not discussed), Chat, IM, pocket casting, podcasting, RFID, RSS (Really Simply Syndication... customizable pushed data), VTC, VoiceXML, VoIP, Webcasts, Wikis	n/a	Citadel, FlashMeeting, Glance, Holocene, Conversation Mode, GoToMeeting, Hexagon, JotSpot, MERBoard, Ourmedia, phpGroupWare, R-CAST, smartMeeting, Socialtext, WiredRed Web, Collaboration at Sea (CAS), Collaborative Information Environment (CIE), Defense Collaboration Tools Suite (DCTS), InfoWorkSpace (IWS), Intelink, WebEx. Plus 31 others.

Title	Author(s)	Source	Uses/Goals	Requirements	Tools
A Framework for Building Collaboration Tools by Leveraging Industrial Components	Du Li, Yi Yang, James Creel, Blake Dworaczyk	CoopIs: OnTheMove Federated Conferences and Workshops. 2006.	Group text editors, group sketch, group calendar, group browser and group to-do list.	Tool is customizable but there is consistent look and feel across different tools	Evolvable and eXtensible Environment for Collaboration (EXEC)
Vector Approach for Analyzing Survey Questions	Sophie Villeneuve, Phillip S.E. Farrell	Defence Research and Development Canada – Toronto, TM 2005-151. 2005.	n/a	n/a	CIE Portal, Document Manager, Info Work Space (IWS), Operations Net Assessment (ONS) database, Effects Based Planning Tools, WebCOP (COP)

Annex B: List of Tools

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
@Mail - Atmail Groupware solution	Complete Web interface for Shared Calendar, Tasks and Address book. Ajax interface, multi-browser compatible. Includes Outlook Sync utility to create a lightweight Exchange clone, running under Linux or Windows.	Collaborative	n/a	Proprietary (@mail)
24SevenOffice	24SevenOffice is an Enterprise resource planning (ERP) and Customer relationship management (CRM) system for small and medium sized businesses delivered on demand through a Ajax-powered web-based interface (Software as a Service). The system includes modules for: CRM, Accounting, Invoicing/Ordering, Procurement, Email, Calandar, Project Management, Content Management system and E-commerce.	Collaborative	Groupware, web based solutions	Proprietary (24SevenOffice)
4Team for Microsoft Outlook	Create and share projects workspaces in Outlook with or without an Exchange server.	Collaborative	n/a	Proprietary (4Team Corporation)
Access Grid	The Access Grid® is an ensemble of resources including multimedia large-format displays, presentation and interactive environments, and interfaces to Grid middleware and to visualization environments. These resources are used to support group-to-group interactions across the Grid.	Collaborative	Real Time Audio, Video and Data Collaboration	Open Source
ACE	A collaborative real-time text editor	Collaborative	Groupware, Other	Open Source
Alfresco	Content-management, workflow, and portal. Provides document management, collaboration, records management, knowledge management, web content management and imaging.	Collaborative	Groupware, Other	Open Source
Defence Knowledge Online (DKO)	Launched in 2001, Defence Knowledge Online allows soldiers to stay connected. DKO offers email, forums, IM, chat, web conferencing and application sharing as well as giving units their own working space.	Collaborative	Mil/Gov	Proprietary (Department of Defense)
Bamboo	A virtual environment toolkit focused on the ability for the system to dynamically configure itself without explicit user interaction, enabling the system to take on new functionality after execution. Enables applications to be dynamically reconfigurable.	FEDEP (Development)	4, 5	Open Source
Bantu	Bantu Instant Messaging (IM) and Presence Platform provides organizations with a secure Instant Messaging technology that includes one-to-one and group messaging, conference rooms with queuing, logging and privacy controls.	Collaborative	Mil/Gov	Proprietary (Bantu)
Basecamp	Web based project collaboration and management tool including chat, time tracking and file sharing.	Collaborative	Mil/Gov	Proprietary (37signals)
Batipi Work Spaces	Secure online collaborative working environment that includes a virtual online internet accessible office allowing access to email, sharing and editing documents with others, and storing files.	Collaborative	n/a	Proprietary (Batipi)
Bricolage	An open-source enterprise-class content management system that assists with creating, managing, and publishing the vast libraries of content essential to any organization. Includes fully-configurable workflows, customizable document types, multisite management capabilities, and comprehensive Perl- and PHP-based templating support.	Collaborative	Groupware, web based solutions	Open Source

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
BSCW Basic Support for Collaborative Work	Enables collaboration over the Web. BSCW is a 'shared workspace' system which supports document upload, event notification, and group management. To access a workspace you only need a standard Web browser as the product is free..	Collaborative	n/a	Proprietary OrbiTeam Software GmbH & Co. KG)
CDCIE Portal	Provide a secure and scalable collaboration tool for DOD that solves the tactical chat, cross domain, full functional (minus video) collaboration requirements	Collaborative	Mil/Gov	Open Source
Central Desktop	Wiki-based on demand team collaboration software for small and medium sized businesses.	Collaborative	n/a	Proprietary (Central Desktop)
Citadel (Groupware)	Community-oriented collaboration software combined with classic e-mail and calendar features that are focused on connecting communities of people together. A Citadel system is made up of containers called “rooms.” A room may be used as an email folder, a discussion forum, a real-time chat, a mailing list, a calendar, an address book, an RSS sink or sometimes a combination of any of the above. Furthermore, you can replicate rooms between multiple Citadel nodes, allowing you to set up a federated, distributed messaging environment.	Collaborative	Groupware, classic client-server solutions	Open Source
Collabnet	Provides solutions for distributed collaborative software development.	Collaborative	n/a	Proprietary (Collabnet)
Collaborative Virtual Workstation (CVW)	This is a software prototype developed by MITRE that supports a collaborative environment optimized for supporting persistent, geographically dispersed virtual rooms. CVW provides chat, audio/video conferencing, application sharing, electronic whiteboarding, and multi-point communications. At the time this paper was written, MITRE was looking for a vendor who would assume responsibility for managing and improving the software	Collaborative	Mil/Gov	Proprietary (MITRE Corporation)
Collabworx	CollabWorx has taken a unique approach to providing collaborative solutions with its CollabWorx Platform. Building collaboration and communication solutions on this platform offers benefits over either of the two traditional approaches: implementing a packaged, “out of the box” solution, or implementing a custom-built solution.” This tool is used by the Army Training Support Center in Fort Eustis, VA. In September 2005, the US Army DITSCAP ATO provided CollabWorx with certification for web-based audio/videoconferencing	Collaborative	Mil/Gov	Proprietary (Collabworx)
Collanos	An open source alternative to Microsoft Office Groove	Collaborative	Project Collaboration, web based solutions	Open Source
Collanos Workplace	Is a peer-to-peer team collaboration desktop tool.	Collaborative	n/a	Proprietary (Collanos)
CommunityZero.	Online community systems for virtual collaboration and knowledge sharing.	Collaborative	n/a	Proprietary (Ramius Corporation)
Composable FORCEnet (CFn)	A tool for expeditionary operations including amphibious assault planning and sustainment ashore of the follow-on and follow-up echelons. CFn is a product of the Space and Naval Warfare Systems Center, San Diego	Collaborative	Mil/Gov	Proprietary (Department of Defense)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Coneix	A project management software	Collaborative	n/a	Proprietary (Coneix)
Confluence	Is an enterprise wiki used for collaboration and knowledge sharing.	Collaborative		Proprietary (Atlassian)
Connect	Highly-customizable meeting, training, and presentation tools are provided to ease the creation, deployment and tracking of online meetings, trainings and on-demand presentations.	Collaborative	n/a	Proprietary (Adobe)
ContactOffice	Is a web based collaboration tool that allows users to set up 'virtual' offices.	Collaborative	n/a	Proprietary (ContactOffice Group S.A.)
Croquet project	Powerful open source software development environment for the creation and large-scale distributed deployment of multi-user virtual 3D applications and metaverses that are (1) persistent (2) deeply collaborative, (3) interconnected and (4) interoperable. The Croquet architecture supports synchronous communication, collaboration, resource sharing and computation among large numbers of users on multiple platforms and multiple devices.	Collaborative	Groupware, Other	Open Source
Data Analysis and Reconciliation Tool (DART)	Regenerates and optimizes existing visual terrain databases for new platforms; can create new versions based on how new sensors would "see" the terrain. Can be used to map and match lexicon items as appropriate.	FEDEP (Development)	3, 4	Unknown
Data Collection Tool (DCT)	After action review (AAR) tool used by Defence Modelling and Simulation Office (DMSO).	FEDEP (Development)	4, 5, 6, 7	Proprietary (Department of Defense)
DEVS	Discrete Event System Specification (DEVS) is a framework for understanding and supporting the activities of modeling and simulation, based on generic dynamic systems concepts.	FEDEP (Development)	4, 5, 6	Unknown
Digital Dashboard	A digital dashboard is a customized solution for knowledge workers that consolidates personal, team, corporate, and external information and provides single-click access to analytical and collaborative tools.	Collaborative	Mil/Gov	Proprietary (Microsoft)
DIS Network voice	Provides a simulated radio model with shared or individual radio access for operators located on dispersed network nodes.	FEDEP (Development)	5, 6	Unknown
DOORS	Requirement Management Tool that contains inherent traceability management functions.	FEDEP (Development)	1, 2, 3	Proprietary (Telelogic)
dotProject	Open source project management software that aims to provide the project manager with a tool to manage tasks, schedules, communication and sharing.	Collaborative	Project Collaboration, web based solutions	Open Source
EditGrid	An online spreadsheet with access control and revision history support, whose RTU (real-time update) feature allows multiple users to collaborate on the same spreadsheet simultaneously.	Collaborative	n/a	Proprietary (Team and Concepts Limited)
eGroupWare	Enterprise ready group ware software that enables the management of contacts, appointments, to dos, etc.	Collaborative	Groupware/Project Collaboration, web based solutions	Open Source

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
eKM (Enterprise Knowledge Management)	eKM creates a shared environment for disparate organizations that have geographically dispersed locations. It is a web-based collaborative suite of knowledge management tools used to capture and manage documents, link command members through Communities of Practice (CoP), manage business processes, and provide ready access to command and enterprise information via search engines.	Collaborative	Mil/Gov	Unknown
Elluminate	Web based, real-time collaboration tool with audio, video, whiteboard, application sharing simultaneously between Windows, Macs, and Linux users.	Collaborative	n/a	Proprietary (Elluminate)
Epiware	Enterprise document management tools including calendar, wiki, tasking/gantt charts, news room, and document version/access histories.	Collaborative	Project Collaboration, web based solutions	Open Source (Proprietary version also available from Epiware)
Equater	Scenario Generation	FEDEP (Development)	4, 5	Unknown
eRooms	The Office of Foreign Disaster Assistance uses eRooms and Abacus. In 2002, eRooms was offered as part of the NMCI COTS Catalogue Contract at the Space and Naval Warfare Systems Command. The monthly service cost was $32 per seat. See: http://tinyurl.com/9sn6g .	Collaborative	Mil/Gov	Unknown
Etazo	Is a suite of products based on a comprehensive online platform for knowledge workers to communicate, collaborate and innovate.	Collaborative	n/a	Proprietary (Citadel Rock Online Communities Inc)
everything engine, backing the everything2 site	The Everything Engine is an open source content management system written in Perl. It is designed for sites which allow submissions by any web user, but can be configured to serve as a content management system for a small number of trusted administrators. It has a very database-centric design; each page in the Everything Engine is a node, and each node has a nodetype which is also a node; much of the code is stored in the database. This simple design has proved to be extremely flexible.	Collaborative	Groupware, web based solutions	Open Source
Exchange Server and the Outlook client	Email exchange and shared calendar.	Collaborative	n/a	Proprietary (Microsoft)
exchange4linux	A collaborative software solution that provides email- and webmail server, common address book, calendar, notes and tasks. It is designed to integrate with Microsoft Office Outlook and third-party tools like PDA-sync or Duplicates Remover for Outlook. It is meant as an alternative to Microsoft Exchange or Microsoft Small Business Server. The product is no longer available for download from the official site. Product support will end in October 2007.	Collaborative	Groupware, classic client-server solutions	Open Source
FedDirector	Part of HLA Lab Works, provides the means to monitor and control the federation execution.	FEDEP (Development)	4, 5, 6	Unknown
FedProxy	Part of the HLA Lab Works suite, can debug federate's HLA interface, perform tests of the RTI & network, and even provide a stand-in for missing federates. Part of HLA Lab Works Suite Tests HLA interface.	FEDEP (Development)	4, 5	Unknown

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Federation Execution Planning Workbook (FEPW)	HLA support DMSO tools	FEDEP (Development)	4, 5	Unknown
FirstClass	Provides solutions for communication, collaboration, content management, and online networking.	Collaborative	n/a	Proprietary (OpenText)
FlashMeeting	It is a simple but sophisticated web based 'meeting' tool, allowing a group of people to setup and have a meeting with each other using the internet. FlashMeeting has a complementary product called FlashMeeting Memo, which supports the direct reference of any part of a live session recording contributed by any one of the participants.	Collaborative	Mil/Gov	Proprietary (Knowledge Media Institute)
FLSIM/HELISIM	Reconfigurable fixed or rotary wing high-fidelity aero-model which can integrate with any technology which HLA enables a simulation.	FEDEP (Development)	4, 5	Unknown
Federation Management Tool (FMT)	HLA support DMSO tools	FEDEP (Development)	5, 6	Unknown
Federation Verification Tool (FVT)	HLA support DMSO tools	FEDEP (Development)	5, 6	Unknown
Generic Applications Server	Web application needs (such as: wiki, blog, discussions, surveys, document repositories, feeds, faqs, portals).	Collaborative	n/a	Proprietary (Things Prime)
GERTICO	Modular RTI based on CORBA.	FEDEP (Development)	4, 5, 6	Proprietary (Fraunhofer Institute)
GL Studio	One tool in the category of rapid application development.	FEDEP (Development)	3, 4	Proprietary (DiSTI)
Glance2	Glance is a real time desktop sharing tool that allows up to fifteen distributed participants to see exactly what you show them on your desktop. They do not need to download anything; they have no costs, and need only use any common browser. Although designed for sales, it can be used for sharing any information or data that needs to be shared within a small distributed group.	Collaborative	Mil/Gov	Unknown
Gobby	Gobby is a free collaborative editor supporting multiple documents in one session and a multi-user chat. It runs on Microsoft Windows, Mac OS X, Linux and other Unix-like platforms.	Collaborative	Editors	Open Source
GoToMeeting	Web conferencing and collaboration tool that facilitates holding effective online meetings, training sessions and collaboration gatherings.	Collaborative	Mil/Gov	Proprietary (Citrix Online)
Groove	A peer-to-peer collaboration platform allowing users the ability to work collectively on a project. Multiple users can log on together or work individually within a shared space that contains the information (e.g., documents, etc.) that they are working on.	Collaborative	Project Collaboration, web based solutions	Proprietary (Microsoft)
GroupVille	Web-based Groupware package for desktops and smartphones	Collaborative	n/a	Proprietary (Sendai Systems)
Hexagon	Simple but sophisticated web based 'presence' tool allowing a group of people to stay in touch with each other within a private, persistent, virtual 'room'. As long as you have an internet connection you can join 'your' Hexagon community anywhere in the world	Collaborative	Mil/Gov	Proprietary (Knowledge Media Institute)
GroupWise	Cross-platform collaborative software product from offering e-mail, calendaring, instant messaging and document management.	Collaborative	n/a	Proprietary (Novell)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
HFC SDK	The HFC-SDK 1.0 included the HLA Foundation Class (HFC) Framework, the OMLib Library, the HFC Automation Tool (HAT) on Windows only, and an HFC rework of the HelloWorld sample federate included with the DMSO RTI1.3v6. The HFC provides an application framework for HLA federates in much the same way the Microsoft Foundation Class (MFC) library provides a framework for Windows applications. OMLib offers the ability to dynamically read in and manipulate HLA object model data from OMT-DIF files. The HAT automates the process of mapping HLA object model content to C++ source code (providing traceability) through specialization of HFC components. HFC SDK 1.3 is the current update to HFC-SDK 1.0 and enables development of HLA federates to collaborate with the DMSO RTI 1.3v6.	FEDEP (Development)	1.3 4, 5	Unknown
HLA Control	Has the functionality of the standard HLA FEPW, plus full lifecycle federation management capabilities. Allows users to plan federation, determine if performance requirements are satisfied and identify and correct run time inaccuracies.	FEDEP (Development)	4, 5, 6	Unknown
HLA Exercise explorer	A fully functional HLA Manager Federate designed to aid in the development of HLA Federates and Federations. The Exercise Explorer provides the developer with critical information about the current running state of an HLA Federation Execution including run time information on each Execution Member.	FEDEP (Development)	5, 6	Unknown
HLA Integration Framework	The framework software provides ready-made use of many HLA functions and simpler interfaces to the RTI.	FEDEP (Development)	5, 6	Unknown
HLA Results	Is a comprehensive data management system with all the features needed to collect, store and understand federation data.	FEDEP (Development)	4, 5, 6, 7	Unknown
Holocene Conversation Mode	Real-time online communications though with a unique interface, the designers argue that the tool provides a much better situation awareness than other chat tools. Takes advantage of the observation that human beings utilize a number of real world characteristics to participate in, perceive, control, and glean subtleties from conversations.	Collaborative	Mil/Gov	Unknown
Horde	PHP-based suite of web applications, including a webmail program, contact manager, calendar manager, etc.	Collaborative	Project Collaboration, web based solutions	Open Source
HP Openview Network Node Manager	Local area and wide area network management tool.	FEDEP (Development)	5, 6	Unknown
Hula mail and calendar based collaboration seeded by Novell	Community project to create an open source collaboration server	Collaborative	Groupware, web based solutions	Open Source
Hummingbird	Provides a highly secure, Web-based collaborative workspace for dispersed teams across and beyond the enterprise.	Collaborative	Mil/Gov	Proprietary (OpenText)
Hyperwave	Collaborative Information Management (CIM)	Collaborative	Mil/Gov	Proprietary (Hyperwave)
Ibis Model Editor	Ibis Model Editor is a CAFDE-compliant software package designed to create HLA-compliant models. Model Editor is still in a beta, not final, stage. As such it may not be as refined as a final product would be. Trial copies may be downloaded for evaluation purposes only.	FEDEP (Development)	3, 4, 5, 6	Proprietary (Ibis Research Corporation)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Ibis RTI Adapter	Ibis RTI Adapter is an ActiveX component that exposes DoD's HLA (High Level Architecture) RTI (Run Time Infrastructure) to COM/ActiveX applications.	FEDEP (Development)	3, 4, 5, 6	Proprietary (Ibis Research Corporation)
Information Workspace (IWS)	A Web-based, collaboration environment featuring virtual rooms, audio/video conferencing, chat, electronic whiteboarding, and application sharing with multipoint communications	Collaborative	Mil/Gov	Proprietary (General Dynamics)
InfoWorkSpace	Provides teams that are geographically dispersed with the ability to collaborate and share information in a real-time virtual environment. Provides organizations the tools to communicate through a variety of options, conferences, and shared applications.	Collaborative	n/a	Proprietary (Ezenia)
Interdaptor	Provides a customizable out of the box solution to you simulation interoperability needs. Provides true interoperability between HLA, DIS, and customized interfaces or protocols; achieves cost-effective HLA compliance; and allows interoperability between legacy and other systems.	FEDEP (Development)	4, 5, 6	Unknown
Intersim	InterSIM software enables simulations and instrumented systems to be networked together in the same synthetic environment according to DIS IEEE 1278.1-1995 or HLA standards. HLA RTI specs 1.1 with DMSO RTI 1.0.	FEDEP (Development)	5, 6	Unknown
ITEMS	ITEMS provides simulation and CGF capabilities; see also STRIVE. Liteflite 3, 4 LiteFlite TM Re-Configurable Simulation Toolkit Is Low-Cost, PCBased Solution Providing Photo-Realistic Geo-Specific Dynamic Environments.MAK Data	FEDEP (Development)	4, 5, 6	Unknown
iUpload (also called Awareness)	Tight integration between blogs and content management, allowing users to take full advantage of the blog phenomenon at a corporate level to connect and stay connected with employees, customers, partners or other key constituencies.	Collaborative	Mil/Gov	Proprietary (Awareness)
Jahia	Content management, corporate portal, document management, and collaboration suite	Collaborative	Groupware, Other	Open Source
JotSpot Wiki	Supports calendars, spreadsheets, file repositories, and photo galleries. Built for ease of use. JotSpot identifies itself as an application wiki. One can create dynamic tables, and attach any type of file	Collaborative	Mil/Gov	Proprietary (Google)
Kolab	An open source groupware suite. It consists of the Kolab server and a wide variety of Kolab clients, including KDE PIM-Suite Kontact (full functionality since KDE 3.4.1), Horde Web frontend (currently in late beta status), Mozilla Thunderbird and Mozilla Lightning with SyncKolab extension (beta) and Microsoft Outlook with Toltec Connector (stable) or Konsec Konnektor (stable). The special idea behind Kolab is the usage of IMAP as an underlying protocol not only for email, but also for contact and calendar entries.	Collaborative	Groupware, classic client-server solutions	Open Source
Kwiki	Wiki software that is especially popular in the Perl community.	Collaborative	Wiki collaborative software	Open Source
Livelink	Comprehensive Web content management solution that enables organizations to create and manage content once and re-use it	Collaborative	n/a	Proprietary (OpenText)
Logger	The MAK Data Logger is a system for capturing and relaying simulation data.	FEDEP (Development)	4, 5, 6	Unknown
Live Communications Server	Instant messaging (IM) and presence software.	Collaborative	n/a	Proprietary (Microsoft)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Live Meeting	Hosted Web conferencing service.	Collaborative	n/a	Proprietary (Microsoft)
Lotus Notes and Domino	Security-rich e-mail, calendaring and scheduling, instant messaging and support for a wide range of business applications.	Collaborative	n/a	Proprietary (IBM)
Lotus QuickPlace	A workspace on the Web for team collaboration among IBM employees and customers, suppliers and Business Partners.	Collaborative	n/a	Proprietary (IBM)
MAK Gateway	The MAK Gateway translates DIS PDUs into RTI service invocations, and vice versa, in real-time.	FEDEP (Development)	5, 6	Unknown
MAK PVD	Provides Multiple Map Views, Controls Stealth, Calculates Line-Of -Sight, Displays Contours and Grid Lines, Language Independent, Extensible Through Plug-In Interface, FOM-Agile Through VRLink's FOM-Mapper Architecture.	FEDEP (Development)	4, 5, 6	Unknown
MAK Real-time RTI	No RTI executive or other central server is necessary to use the MAK RTI, making initialization quick and easy. It can be configured to use point-to-point, broadcast, or multicast communications for maximum flexibility across different network architectures. Optimized for realtime simulations.	FEDEP (Development)	5, 6	Unknown
MAK Stealth	Used for 3D visualization, situation awareness, debugging a simulation, or after-action review.	FEDEP (Development)	4, 5, 6	Unknown
MAK VR Forces	CGF Mäk tools. Not a tool to support process but a possible federate.	FEDEP (Development)	4, 5, 6	Unknown
Marratech	Realtime collaboration with audio, video, whiteboard and chat.	Collaborative		Proprietary (Google)
MediaWiki	A free software wiki package originally written for Wikipedia.	Collaborative	Wiki collaborative software	Open Source
Meebo	Meebo tool provides IM capability across various IM services and, being web-based unlike most IM clients, can be accessed from any computer, not just one's office or home computer.	Collaborative	Mil/Gov	Unknown
MERBoard	Intended for use as a collaboration tool within a corporate environment to support fast encounters and spontaneous meetings, it is also used as a multi-mission platform for collaborative mission control applications for NASA	Collaborative	Mil/Gov	Unknown
MERIT	A powerful, web-enabled tool that graphically depicts the current Marine Corps readiness posture and detailed supply and maintenance information using emerging data visualization techniques. MERIT transforms data into information that provides a dynamic and adaptable view of equipment readiness by commodity, functional area, and organization	Collaborative	Mil/Gov	Unknown
MindManager	MindManager 6 is the market leading productivity software for visualizing and managing information, allowing individuals and teams to more effectively think, plan, and collaborate.	Collaborative	n/a	Proprietary (Mindjet)
ModIOS 2D PVD 4,	The Plan View Display (PVD) is one application in the ModIOS tool suite. It provides a 2D view of the simulation and configurable icons. Designed for DIS and included HLA gateway.	FEDEP (Development)	5, 6	Unknown
ModIOS 3D Stealth Viewer	The Stealth Viewer is one application in the ModIOS tool suite. It provides a 3D display of the battlefield from various points of view (cockpit, independent, etc.) Supports smoothing of entity positions, special effects such as explosions, and atmospheric effects. Designed for DIS and included HLA gateway.	FEDEP (Development)	4, 5, 6	Unknown

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
ModIOS AAR	The After Action Review (AAR) is one application in the ModIOS tool suite. It provides a data logging and replay facility, automatic generation of performance reports, and remote control of the 2D PVD and 3D Stealth Viewer. Designed for DIS and included HLA gateway.	FEDEP (Development)	5, 6, 7	Unknown
ModIOS Exercise Controller	The Exercise Controller is one application in the ModIOS tool suite. It provides configurable control of simulation applications, including 2D and 3D displays, computer-generated forces, etc. It is used to start, resume, stop and freeze simulations, generate reports, create and remove entities, etc. Designed for DIS and included HLA gateway.	FEDEP (Development)	5, 6	Unknown
ModIOS logger/player	The Logger/Player is one application in the ModIOS tool suite. It provides a data logging and replay facility. Designed for DIS and included HLA gateway.	FEDEP (Development)	4, 5, 6	Unknown
ModISE	Framework that facilitates composition of and interoperability among interactive simulation applications. It includes a web-based model repository, a GUI and a run-time Interoperability engine. ModISE stands for Modular Interoperable Synthetic Environment.	FEDEP (Development)	4, 5, 6	Unknown
ModSAF	Computer Generarated Forces (CGF) creation. It is not a tool to support process but a possible federate. Retired software that is being replaced by OneSAF Test Bed version 1.0.	FEDEP (Development)	4, 5, 6	Proprietary (Department of Defense)
Multigen	Products that help to collect, rectify, build, and publish data for simulations involveing complex real-time 3D environments	FEDEP (Development)	2 3, 4	Proprietary (Presagis, through CAE)
Multigen Creator	Creator is a comprehensive toolset for the rapid generation of optimized object models, high fidelity terrain and synthetic environments for use in realtime 3D visual simulation, simulation based training, and urban simulation.	FEDEP (Development)	3, 4	Proprietary (Presagis, through CAE)
Multigen Creator -Sedris export	MultiGen SEDRIS Exporter is a plug-in for Creator that provides interoperation technology for the defense training and simulation community. The SEDRIS Exporter is a flexible, user-guided SEDRIS database production solution that supports STRICOM and DMSO's Synthetic Interoperability Strategy in an easy-to-manage procedural workflow. The SEDRIS Exporter translates industry standard 3D OpenFlight files into the SEDRIS Transmittal Format (.stf), making this an invaluable tool for any project with SEDRIS data requirements.	FEDEP (Development)	3, 4	Proprietary (Presagis, through CAE)
My Teamwork	Is a web-based collaboration tool supporting presence, instant messaging, audio and video conferencing and application sharing	Collaborative	n/a	Proprietary (Alcatel)
MyWebDesktop	Personal and collaborative desktop on the internet.	Collaborative	n/a	Proprietary (MyWeb Desktop.net
Netmeeting	A Microsoft product that supports point-to-point communications for its audio/video conferencing, chat, application sharing, and electronic whiteboarding	Collaborative	n/a	Proprietary (Microsoft)
Nuxeo Collaborative Portal Server	Content management and collaborative platform based on Zope	Collaborative	Groupware, web based solutions	Open Source
Office.com	A Web-based integrated suite of 15 applications that includes group calendaring, document management, contact management, email, wiki and other collaborative tools.	Collaborative	n/a	Proprietary (Office.com)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Office Gateway	Online collaboration suite for that uses the internet to allow teams to work both remotely (accessing the office from anywhere) and together (sharing schedules, documents and information). Company based in Atlantic Canada.	Collaborative	n/a	Proprietary (Alt Linus)
Object Model Development Tool (OMDT)	DMSO tool that automates the process of constructing SOMs and FOMs	FEDEP (Development)	3, 4, 5	Unknown
OMDT Pro	Editor for creation and modification of SOMs and FOMs.	FEDEP (Development)	3, 4, 5	Unknown
Omni 4,	Part of the HLA Lab Works suite, used to Integrate simulations Omni is a set of related software components and applications that together give simulations the ability to establish a Federation Object Model (FOM) independent interface to the HLA Runtime Infrastructure (RTI). Part of the HLA Tool Suite Middleware used to integrate	FEDEP (Development)	5	Unknown
OneSAF Testbed	Used in the creation of Computer Generated Forces.	FEDEP (Development)	4, 5, 6	Unknown
OpenGroupware.org	Their goal is to create a groupware server to integrate the leading open source office suite products	Collaborative	Groupware, classic client-server solutions	Open Source
OpenLink Wiki Engine	A distributed collaborative suite of applications that includes: Weblog Engine, Wiki Engine, Bookmark Manager, Discussion/Conversation Services, Feed Aggregation, Photo Sharing, and Unified Data Storage etc. It includes realm specifc data access via SPARQL, GData, OpenSearch, XQuery, XPath, and Full Text in general.	Collaborative	Wiki collaborative software	Open Source
Open-Xchange	Email, calendar, contacts, tasks and documents are includes as part of its 11 collaboration modules. Integrates with PDA's.	Collaborative	Groupware, web based solutions	Open Source
Ourmedia	A project allowing any person with net access to publish their text, image, audio and/or video files for public consumption.	Collaborative	Mil/Gov	Open Source
PabloDraw	Collaborative text and ANSI/ASCII art editing on Windows	Collaborative	n/a	Open Source
phpGroupWare	A multi-user groupware suite written in PHP that provides about 50 web-based applications (including Calendar, Address Book, an Advanced Projects Manager, Todo List, Notes, Email, Newsgroup- and Headlines Reader, a File Manager). The system as a whole supports user preferences, themes, user permissions, multi-language support and user groups.	Collaborative	Groupware, classic client-server solutions/web based solutions	Open Source
PHProjekt	PHProjekt is a modular application for the coordination of group activities and to share information and documents via the web. Components include Group calendar, project management, time card system, file management, contact manager, mail client. Etc.	Collaborative	Project Collaboration, web based solutions	Open Source
ProjectDox	Construction Project Management and Collaboration Software	Collaborative	n/a	Proprietary (Avolve)
pRTI	Pitch's portable Runtime Infrastructure (pRTI) is a platform independent software that provides HLA services used by federates to co-ordinate their operations and data exchange during an HLA federation execution. pRTI implements all services documented in the HLA Interface Specification v1.3.	FEDEP (Development)	5, 6	Unknown

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
pRTI for IEEE 1516	The product implements the entire 1516 standard. First commercial IEEE 1516 RTI.	FEDEP (Development)	5, 6	Unknown
PSI-SA 3	User friendly API to RTI. Stresses the modelling aspect.	FEDEP (Development)	4, 5	Unknown
RAL Wrapper	RTI Abstraction Layer for C++ developed simulation. Facilitate design, allow automatic generation of code and execution.	FEDEP (Development)	4, 5	Unknown
Rally Point	A web based HomeOwners Association (HOA) software designed to manage files, notes, cars, for people who live together	Collaborative	n/a	Proprietary (WBP Systems)
R-CAST	R-CAST supports collaborative activities among teammates comprised of both humans and software systems.	Collaborative	Mil/Gov	Unknown
RealDB	Realistic up-to-date models. Canadian, Russian, and U.N. army equipment visual models, 3 levels of detail plus damage states.	FEDEP (Development)	3, 4	Unknown
S2Focus	Provides exercise management tools, including a Mission Planner, Recorder, Manager, Viewer, and Analyzer.	FEDEP (Development)	4, 5, 6	Unknown
SAIDA	Security extensions to the RTI prototype (CERTI) developed at ONERA (Office National d'Etudes et de Recherches Aerospatiales). These extensions are aimed at guaranteeing secure interoperation of simulations belonging to various mutually suspicious organizations. It is an UK/F cooperation.	FEDEP (Development)	4, 5, 6	Unknown
SameTime	A Lotus product that interfaces with most Web browsers and provides audio/video conferencing, chat, application sharing, electronic whiteboarding, and awareness with multipoint communications	Collaborative	Mil/Gov	Proprietary (IBM)
Scalix	Linux email, calendaring and messaging platform.	Collaborative	Groupware, classic client-server solutions	Proprietary (Xandros)
Scoop	Scoop is a "collaborative media application" that is somewhere between a content management system, a web bulletin board system, and a weblog. Scoop is designed to enable your website to become a community by empowering visitors to be the producers of the site, through contributing news and discussion.	Collaborative	Groupware, web based solutions	Open Source
Sedris tools	A synthetic environment data interchange programme.	FEDEP (Development)	3, 4	Unknown
Sequoia Integrator for HLA	The Integrator provides the means to rapidly integrate new or existing simulation systems into HLA environments. SEQUOIA Integrator for HLA v1.0 is currently available on Windows NT© for use with RTI1.3NG-V3.	FEDEP (Development)	4, 5	Unknown
SGT	Scenario generation HLA lab works.	FEDEP (Development)	3, 4	Unknown
ShareDirect	ShareDirect lets you connect any folders on your PC to any number of users instantly and securely.	Collaborative	n/a	Proprietary (Share Direct)
ShareO for Microsoft Outlook	Share Outlook calendar, contacts, journal, mail, tasks and notes folders as well as documents and files with other Outlook users without a server.	Collaborative	n/a	Proprietary (4Team Corporation)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
SharePoint Services and Microsoft SharePoint Portal Server	Microsoft's integrated suite of server capabilities for enterprise search, content management, business process facilitation, simplified information sharing, and enhanced business insight.	Collaborative	n/a	Proprietary (Microsoft)
Simple Groupware	A groupware package written in PHP that uses the MySQL database (version 4 or higher). It contains a calendar system, an email client, an inventory system, and a number of other features.	Collaborative	Groupware, web based solutions	Open Source
Simplex 3	The main design concept behind the HLA-interface of Simplex 3 is to hide all HLA-functionality from the model developer. It should be noted, that this approach leaves the entire model description of Simplex 3 models unchanged, no matter if they act as stand-alone models or federates in the sense of HLA. With that kind of an HLA interface the entire interoperability issue is part of the simulation system itself, and thus not part of the simulation model. One the one hand this facilitates the re-use of existing models, and on the other hand the developer of new models does not need to have additional knowledge for building HLA-compliant models.	FEDEP (Development)	4, 5, 6	Unknown
SIMplicity	SIMplicity is an integrated development environment (IDE) that enables developers and scientists to rapidly assemble component based HLA simulations from new and pre-existing components in a visual environment. SIMplicity assists the developer throughout the development life cycle, from design to development, deployment and execution. SIMplicity uses a template-driven code generation process to create all of the simulation entities for the targeted platform specific simulation model (PSM).	FEDEP (Development)	4, 5, 6	Proprietary (Calytrix)
Simulation Support Environment DUCTOR	DUCTOR is an architecture which allow to develop operational simulations running stand-alone or as an HLA federate. It is OO (UML based) and promotes re-use of scenarios, specific behaviours and platforms.	FEDEP (Development)	3, 4, 5, 6	Unknown
Simulation Support Environment ESCADRE	Encapsulate and hide low level HLA interface functionality, providing high level services for HLA interoperability. Provide an OO methodology and a tool set to design, implement and run standalone simulations and HLA federates.	FEDEP (Development)	3, 4, 5, 6	Unknown
Skopeo Animation System	In order to run in a distributed environment, Skopeo was extended for HLA. This extension uses the Beta release of the Java RTI API from DMSO. It is written in Java and runs stand-alone or as applet in any javacapable web browser. Skopeo was enhanced for 3D animation using VRML2. Additionally CORBA mechanisms are used for communication between the Skopeo Applet and the Skopeo server.	FEDEP (Development)	4	Unknown
Skype	Skype is a program for making free calls over the internet to anyone else who also has Skype. SkypeOut allows Skype users to call traditional telephone numbers, including mobile telephones, for a small fee.	Collaborative	Mil/Gov	Proprietary (Skype Limited)
SlashCode software	The open source collection of Perl modules and stand-alone programs which runs Slashdot, one of the oldest and most popular collaborative weblogs.	Collaborative	Groupware, web based solutions	Open Source
SLX Simulation Environment	HLA interface provided SLX is a discrete event simulation tool for the Windows 95/98/NT operating systems. It is a simulation language oriented tool. The SLX user is provided with an interface to the RTI and the possibility of "doing" distributed simulation based on HLA without having to deal with the lowest API-level of HLA.	FEDEP (Development)	4, 5	Unknown

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
SmartFED	SmartFED has been designed to operate on simulations based on the High Level Architecture (HLA), developed by the US Defense Modeling and Simulation Office (DMSO).	FEDEP (Development)	4, 5, 6	Unknown
SmartMeeting	SmartMeeting is a conferencing, collaboration and live presentation system that utilizes a new type of online meeting: a 3-D, fully-immersive, voice-enabled with spatial 3D sound, avatar-driven, multi-featured virtual office space.	Collaborative - CM	Mil/Gov	Proprietary (Convenos)
SMOC	A standard interface to HLA for developers of models and simulations. Serves as a DIS/HLA gateway to avoid expensive modifications to DIS-compliant systems.	FEDEP (Development)	5, 6	Unknown
Socialtext	As the first wiki company, Socialtext is the leader in making web collaboration secure, scalable and easy to use	Collaborative	Mil/Gov	Proprietary (Socialtext Incorporated)
SPEEDES	A simulation engine allows the simulation builder to perform optimistic parallel processing on high performance computers, networks of workstations, or combinations of networked computers and HPC platforms.	FEDEP (Development)	4, 5, 6	Open Source
Spider	Although primarily a resource tool, it does support 37 discussion links that include chat rooms, and 23 listservs links.	Collaborative	Mil/Gov	Proprietary (Human Performance Centre)
STAGE Scenario	Simplifies the building of a tactical database to then simulate dynamic, interactive, complex, and real-time tactical or operational environments.	FEDEP (Development)	4, 5, 6	Proprietary (Presagis, through CAE)
STRIVE	Includes commercial off-the-shelf simulation development environment and a high fidelity, full function synthetic tactical environment and computer generated forces package. Helps shorten development cycles by allowing developers to focus on building models without the concern for how the models communicate, interact, and perform in real-time.	FEDEP (Development)	4, 5, 6	Proprietary (CAE)
SubEthaEdit	A powerful and lean collaborative text editor	Collaborative	n/a	Proprietary (TheCodingMonkeys)
Synapse Corporate Solutions	Web-Based Business Software	Collaborative	n/a	Proprietary (Synapse Corporate Solutions)
TalkAndWrite	TalkAndWrite is a freeware whiteboard fast and simple powered by Skype.A Realtime collaboration tool.	Collaborative	n/a	Proprietary (TalkAndWrite)
TeamLeader	A way to manage outsourced teams. Includes workshops, task management, discussions, document handling, status reporting etc.	Collaborative	n/a	Proprietary (Process-one)
TeamLinks	Fully integrated presence awareness, IM, VoIP, whiteboard, instant meetings and collaboration tools, completely secure across domains	Collaborative	n/a	Proprietary (Imera)
TeamWork Live	TeamWork Live is a hosted web-based project management and team collaboration tool by CollectiveSoft.	Collaborative	n/a	Proprietary (TeamWork Live)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
TeamPage	Traction's model focuses on collaboration within and among groups using a sophisticated permission model that aggregates multiple blog/wiki spaces using a web-based Journal modeled on the principals of Douglas Engelbart's On-Line_System (NLS).	Collaborative	n/a	Proprietary (Traction Software Inc)
Telestra HLA	Supports execution, Remote HLA Management, Radio Simulation and Communications.	FEDEP (Development)	4, 5, 6	Unknown
Terra Vista/Terra Vista Pro Builder	Used to create visual terrain databases in OpenFlight or TerraPage formats. ProBuilder version intended for "power users". Both versions are extensible.	FEDEP (Development)	3, 4	Unknown
TerraTools	Terrain DB Construction Tool.	FEDEP (Development)	3, 4	Unknown
Thinkature	Thinkature brings rich communication to the web by combining an instant messaging system with shared, visual workspace.	Collaborative	n/a	Proprietary (Thinkature)
TikiWiki	A full featured, multilingual, Wiki/Content Management Services (CMS)/Groupware written in PHP and maintained by an active and international community of benevolent contributors.	Collaborative	Wiki collaborative software	Open Source
Tracker Suite	Tracker Suite leverages the Lotus Notes / Domino email platform to provide modular, Web-enabled applications for project management, help desk, personnel management, time and expense reporting, purchasing, asset tracking, CRM, sales force automation and business reporting.	Collaborative	n/a	Proprietary (Automation Centre)
TrackerOffice	TrackerOffice leverages the Microsoft Outlook / Exchange email platform to provide tools for project management, invoicing, time and expense reporting, purchasing and business reporting.	Collaborative	n/a	Proprietary (Automation Centre)
TUTOS	A tool to manage the organizational needs of small groups, teams, departments in project management and development that includes: a calendar for users and groups; address manager for people, companies and departments; bug tracking system; product/project repository; mailboxes; timetracking on projects, installations and bugs; Invoices; Watchlists to stay informed on changes on projects/bugs etc via email; support for teams that are distributed over different timezones; color themes / layout; fine grained permission handling; change history.	Collaborative	Groupware/Project Collaboration, web based solutions	Open Source
TWiki	Enterprise wiki, enterprise collaboration platform and knowledge management system	Collaborative	Wiki collaborative software	Open Source
UOB DAT	MSIAC Web Page; Support Exercises Composition.VAPS 4 Rapid prototyping of complex human computer interfaces; generates C-Code which can be HLA enabled using any HLA integrator product.	FEDEP (Development)	2, 3, 4	Unknown
VEGA 3,	Vega Prime is a software environment for the creation and deployment of realtime visual simulation, virtual reality, sensor and general visualization applications. Vega Prime combines simulation functionality with tools to create an infrastructure to build, edit and run sophisticated applications.	FEDEP (Development)	4, 5	Unknown
VIP Task Manager	Client/server collaboration software that allows authorized users to simultaneously access and share common database through Local Network (LAN) to see, add and assign tasks, automatically send and receive notifications	Collaborative	n/a	Proprietary (VIP Quality Software)

Tool	Description	Collaborative or FEDEP Focus	Sub-Category/ FEDEP level supported	Open Source/ Proprietary (Vendor)
Virtual OS	Open source web operating system or distributed web desktop developed by Advanced Webhosting Network that creates a shared virtual desktop environment on a remote server to promote collaboration, simplify content management and potentially reduce the effort associated with network installation	Collaborative	Project Collaboration, web based solutions	Open Source
Virtual Program Office (VPO)	A Virtual Program Office application is based on the IBM/Lotus Domino technology, and was designed to enable geographically dispersed teams to work collaboratively via the Internet in a secure environment. They are: secure, accessible to anyone who has prior permission including contractors, supports membership access levels, organized to support distributed work, and can support very large documents.	Collaborative	Mil/Gov	Unknown
Visual OMT	Visual OMTT is a project-based multiple-document (MDI) application supporting Simulation Object Models, Federation Object Models and Data Dictionary documents. Object-model elements can be copied within and between documents by drag and drop.	FEDEP (Development)	3, 4, 5	Unknown
VR Link	With MAK's VR-Link networking toolkit you can network simulators and virtual reality applications together, using the HLA.	FEDEP (Development)	4	Unknown
Webasyst	A suite of web based software applications for group online collaboration.	Collaborative	n/a	Proprietary (WebAsyst)
WebCOP (joint)	Framework for developing Distributed GIS capabilities. Web application built using Java and ESRI Map Objects Java Edition (MOJE). Provides GUI; handles map requests; gathers maps from Distributed Services; displays an aggregated map image; ArcIMS, WMS and WFS are all supported by Joing WebCOP	Collaborative - CFEC	n/a	Unknown
WebEx	Collaborate and communicate securely over the web. Share documents, make presentations, demonstrate products and collaborate capabilities.	Collaborative	n/a	Proprietary (WebEx)
WiredRed Web	Secure, multipoint routing technology power an e/pop® product line, which includes multiparty video conferencing, web conferencing and secure IM software.	Collaborative - CM	Mil/Gov	Proprietary (WiredRed)
Workspot	A web service that gives a Linux desktop (outside your network), which can be shared securely through a browser.	Collaborative	n/a	Proprietary (Workspot)
WorkZone	Easy-to-use online collaborative software for securely sharing work with colleagues, clients and team members.	Collaborative	n/a	Proprietary (Trichys)
yaRTI	yaRTI is an HLA RTI implemented in Ada95, using the Distributed Systems Annex features.	FEDEP (Development)	5, 6	Unknown
Zimbra	Open source messaging and collaboration application. The powerful web client integrates email, contacts, shared calendar, VoIP, and online document authoring into a browser-based interface. Zimbra also offers over-the-air "push" synchronization to mobile devices, a complete high security package including built-in anti-spam and anti-virus scanning and features Archiving and Discovery to save and search email.	Collaborative	Groupware, classic client-server solutions/ web based solutions	Open Source
Zing Technologies AnyZing and ZingThing	Electronic Learning and Meeting System software for team rooms and networks.	Collaborative	Mil/Gov	Proprietary (Zing Technologies Pty. Ltd)

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Annex C: Applied Evaluation Matrices

Requirements

Tool:
Groove
Is a Microsoft Windows based peer-to-peer platform. Groove, a subsidiary of Microsoft, is a collaboration tool allowing "users the ability to work collectively on a project. Multiple users can log on together or work individually within a shared space that contains the information (e.g., documents, etc.) that they are working on. Users will not have access to a shared space or associated information unless they have been invited to, and accept, the invitation to participate. If a user is uninvited, new keys are distributed by Groove to all remaining participants." The Department of Homeland Security uses Groove, primarily because of its encryption capability, and because the audio is also encrypted. The U.S. Department of State "used Groove to coordinate the establishment of the U.S. Embassy in Baghdad. Gallaher and O'Rourke (2004) reported that 27 percent of their Naval Postgraduate School survey respondents reported using Groove. Additionally, the U.S. Army Corps of Engineers uses Groove as part of its common operating environment tha

Uses/Goals	Supports synchronous work and comms	Supports asynchronous work and comms	Provides real-time synchronisation of view, including user interaction	Fast, consistent response and transfer times	Graphic interface and markup functionality	Supports distributed teams	Has distinct member roles (active/passive, master/client)	Searchable/writable d'base access w/ resusable classes (federates, federations, etc.)	Supports heterogeneous software (inc non-collaborative apps)	Error tolerant	Allows for user privacy	Little user training required	Results in increased productivity	Ability to 'lock' object/file	Accommodates standard policies for use, inc processes, IP, etc.	Has context management	Includes software agents that determine what files/documents are impacted by a change	Indicates 'new', 'changed'	Maintains single version of document w/ auto-version control	Indicates Personnel Presence	Indicates Network Presence	Minimizes formatting	Templates available	Supports word processing documents	Supports spreadseeet documents	Supports presentation documents	Supports software code files	Allows application sharing & shared file editing
Communication	Y	Y	Y	U	Y	Y	Y				Y	Y	Y		U			Y		Y				Y	Y	Y		Y
Design			Y	U	U	Y	Y	N	Y	Y		Y	Y	Y	U	Y	N		Y			N	N	Y	Y	Y	Y	Y
File sharing				U	Y	Y	Y	N	Y			Y	Y	Y	U			Y	Y					Y	Y	Y	Y	Y
File storage						Y		N		Y		Y	Y		U				Y									
Archiving						Y		N		Y		Y	Y	Y	U				Y				N					
Simulation/demonstration			N	N	N	N	N		N	N		N	N		N								N	Y	Y	Y	Y	
Testing/validation			N	N	N	N	N		N			N	N		N	N	N				Y		N	Y	Y	Y	Y	
Planning					N	Y		N				Y	Y		U													
Project monitoring/control				U	Y	Y	Y					Y	Y		U			Y	Y									
Workflow control				U		Y						Y	Y		U	Y	N		Y									
Security/access control				U		Y	Y				Y	Y	Y	Y	U													
Social activities and team building	Y	Y	Y			Y	Y					Y	Y		U					Y				Y	Y	Y		Y
Automated project support					Y	Y		N		Y		Y	Y		U	Y	N	Y				N	N					
Resource allocation					Y	Y	Y				Y	Y	Y		U				Y									
Decision support				U	Y	Y		N	U			Y	Y		U	N	N				Y		N					
Analysis support				U	Y	Y		N	U			Y	Y		U	N	N						N					
Team coordination	Y	Y	Y	U		Y	Y					Y	Y		U	Y	N	Y	Y									
Software coding/programming				U	N	Y		N	Y	Y		Y	Y	Y	U	N	N		Y				N				Y	Y
Network development					N	Y		N	N	N		Y	Y	N	U	N	N				Y		N				Y	
Total Score:	15	15	20	0	28	17	16	0	3	5	3	85	85	5	0	12	0	25	45	10	15	0	0	30	30	30	30	25

Uses/Goals	Supports text comms (inc e-mail, chat, etc.)	Supports audio comms	Supports video comms	Supports heterogeneous comms	Open Source	Application Trusted	Supports top-down working	Supports bottom-up working	Usable	Customisable interface (especially if proprietary application)	First impression positive	Supports heterogeneous platforms (including PDAs)	Interoperable	Supports heterogeneous users	is scalable to required number of users	Has automatic archiving	Has automatic backup	Has a clear, modular, flexible structure which mirrors topic area	No requirement to follow a linear work path	Audit Trail available	Permits access to other networks	Maintains Atomicity	Extensible	Registration/log on/off procedure	Selective Access (control of who sees what when)	Easy to Install	Easy to Maintain	
Communication	Y	N	N	N		U	Y	Y	Y	Y	U	N	N	U	Y			N		N	Y	N			Y	Y	U	24
Design					N	U	Y	Y	Y	Y	U	N		U	Y			N	Y		Y		Y			Y	U	24
File sharing						U			Y	Y	U	N	N	U	Y			N		N	Y	N			Y	Y	U	20
File storage						U			Y	Y	U	N	N	U	Y	Y	Y	N								Y	U	11
Archiving						U			Y	Y	U	N	N	U	Y	Y		N				N				Y	U	11
Simulation/demonstration						U			Y	Y	U	N	N	U	Y			N			Y				Y	Y	U	10
Testing/validation						U			Y	Y	U	N	N	U	Y			N			Y				Y	Y	U	11
Planning						U	Y	Y	Y	Y	U			U	Y			N								Y	U	9
Project monitoring/control						U	Y	Y	Y	Y	U			U	Y			N	Y	N		N			Y	Y	U	15
Workflow control						U	Y	Y	Y	Y	U	N		U	Y			N	Y	N						Y	U	12
Security/access control						U			Y	Y	U	N		U	Y			N			Y			Y		Y	U	12
Social activities and team building	Y	N	N	N		U			Y	Y	U			U	Y			N								Y	U	17
Automated project support					N	U	Y	Y	Y	Y	U			U	Y	Y	Y	N	Y				Y		Y	Y	U	18
Resource allocation						U	Y	Y	Y	Y	U			U	Y			N								Y	U	13
Decision support						U	Y	Y	Y	Y	U			U	Y			N	Y				Y			Y	U	13
Analysis support						U	Y	Y	Y	Y	U			U	Y			N	Y			N	Y			Y	U	12
Team coordination						U	Y	Y	Y	Y	U			U	Y			N	Y	N					Y	Y	U	18
Software coding/programming	Y	N	N	N	N	U			Y	Y	U	N	N	U	Y			N	Y	N			Y			Y	U	16
Network development					N	U			Y	Y	U	N	N	U	Y			N	Y	N		N	N			Y	U	10
Total Score:	15	0	0	0	0	0	30	30	76	76	0	0	0	0	57	6	4	0	27	0	6	0	20	4	28	76	0	277104

HUMANSYSTEMS Incorporated

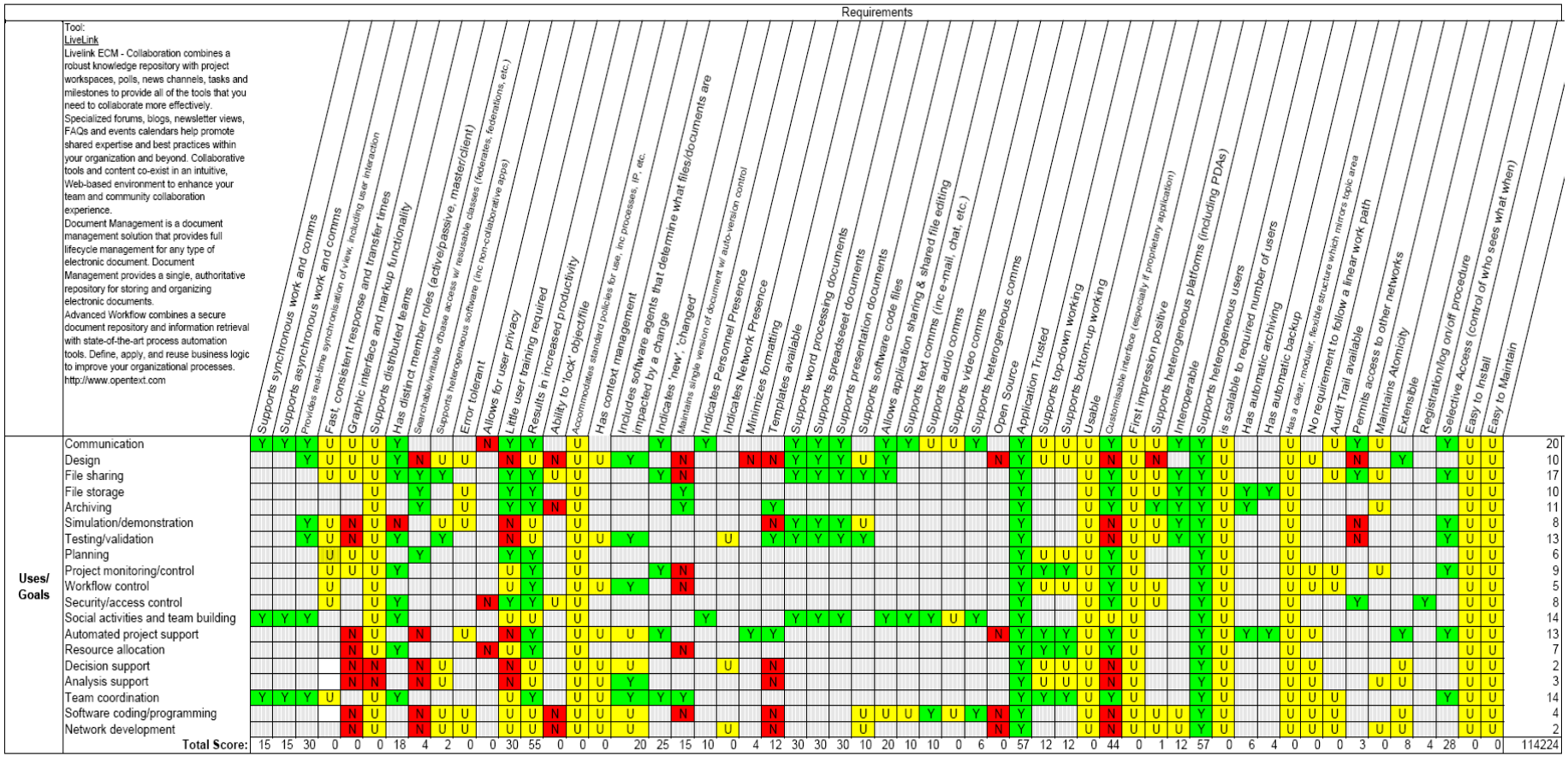
Tool:
Google Docs
If you've ever struggled to keep track of different versions of spreadsheet or word processor files sent by email, Google Docs & Spreadsheets may be right for you. Google Docs & Spreadsheets is a free web-based word processing and spreadsheet program that keeps documents current and lets the people you choose update files from their own computers. You can, for example, coordinate your student group's homework assignments, access your family to-do list from work or home, or collaborate with remote colleagues on a new business plan. Import your existing documents and spreadsheets, or create new ones from scratch.
Edit your documents and spreadsheets from anywhere. All you need is a Web browser - your documents and spreadsheets are stored securely online.
Share changes in real-time. Invite people to your documents/spreadsheets and make changes together, at the same time.

Requirements

Uses/Goals	Supports synchronous work and comms	Supports asynchronous work and comms	Provides real-time synchronisation of view, including user interaction	Fast, consistent response and transfer times	Graphic interface and markup functionality	Supports distributed teams	Has distinct member roles (active/passive, master/client)	Searchable/writable dbase access w/ resusable classes (federates, federations, etc.)	Supports heterogeneous software (inc non-collaborative apps)	Error tolerant	Allows for user privacy	Little user training required	Results in increased productivity	Ability to 'lock' object/file	Accommodates standard policies for use, inc processes, IP, etc.	Has context management	Includes software agents that determine what files/documents are impacted by a change	Indicates 'new', 'changed'	Maintains single version of document w/ auto-version control
Communication	Y	Y	Y	Y	Y	Y	N				N	Y	Y		Y			N	
Design			Y	Y	Y	Y	N	N	N	U		Y	Y	N	Y	N	N		P
File sharing				Y	Y	Y	N	N	N			Y	Y	N	Y			N	P
File storage						Y		N		U		Y	Y		Y				P
Archiving						Y		N		U		Y	Y	N	Y				P
Simulation/demonstration			N	N	N	N	N		N	N		N	N		N				
Testing/validation			Y	Y	Y	Y	N		N			Y	Y		Y	N	N		
Planning					N	N		N				N	N		N				
Project monitoring/control				N	N	N	N					N	N		N			N	N
Workflow control				N		N						N	N		N	N	N		N
Security/access control				Y			N				N	Y	Y	Y	Y				
Social activities and team building	Y	Y	Y			Y	N					Y	Y		N				
Automated project support					N	N		N		N		N	N		N	N	N	N	
Resource allocation					N	N	N				N	N	N		N				N
Decision support				N	N	N		N	N			N	N		N	N	N		
Analysis support				N	N	N		N	N			N	N		N	N	N		
Team coordination	N	N	N	N		N	N					N	N		N	N	N	N	N
Software coding/programming				Y	Y	Y		N	N	U		Y	Y	Y	Y	N	N		P
Network development					Y	Y		N	N	U		Y	Y	Y	Y	N	N		
Total Score:	10	10	20	24	24	9	0	0	0	0	0	50	50	3	45	0	0	0	13

Uses/Goals	Indicates Personnel Presence	Indicates Network Presence	Minimizes formatting	Templates available	Supports word processing documents	Supports spreadseeet documents	Supports presentation documents	Supports software code files	Allows application sharing & shared file editing	Supports text comms (inc e-mail, chat, etc.)	Supports audio comms	Supports video comms	Supports heterogeneous comms	Open Source	Application Trusted	Supports top-down working	Supports bottom-up working	Usable
Communication	N				Y	Y	N		P	Y	N	N	N		Y	P	P	Y
Design			N	N	Y	Y	N	Y	P					N	Y	P	P	Y
File sharing					Y	Y	N	Y	P						Y			Y
File storage															Y			Y
Archiving				N											Y			Y
Simulation/demonstration				N	Y	Y	N	Y							N			N
Testing/validation		N		N	Y	Y	N	Y							Y			Y
Planning															N	N	N	N
Project monitoring/control															N	N	N	N
Workflow control															N	N	N	N
Security/access control															Y			Y
Social activities and team building	N				Y	Y	Y		Y	Y	N	N	N		Y			Y
Automated project support			N	N										N	N	N	N	N
Resource allocation															N	N	N	N
Decision support		N		N											N	N	N	N
Analysis support				N											N	N	N	N
Team coordination															N	N	N	N
Software coding/programming				N				Y	P	Y	N	N	N	N	Y			Y
Network development		N		N				Y						N	Y			Y
Total Score:	0	0	0	0	30	30	5	30	15	15	0	0	0	0	30	3	3	40

Uses/Goals	Customisable interface (especially if proprietary application)	First impression positive	Supports heterogeneous platforms (including PDAs)	Interoperable	Supports heterogeneous users	Is scalable to required number of users	Has automatic archiving	Has automatic backup	Has a clear, modular, flexible structure which mirrors topic area	No requirement to follow a linear work path	Audit Trail available	Permits access to other networks	Maintains Atomicity	Extensible	Registration/log on/off procedure	Selective Access (control of who sees what when)	Easy to Install	Easy to Maintain	
Communication	N	Y	Y	N	Y	Y			N		N	Y	N			N	Y	Y	22.5
Design	N	Y	Y		Y	Y			N	Y		Y		N			Y	Y	22
File sharing	N	Y	Y	N	Y	Y			N		N	Y	N			N	Y	Y	19
File storage	N	Y	Y	N	Y	Y	Y	Y	N								Y	Y	14.5
Archiving	N	Y	Y	N	N	Y	Y		N								Y	Y	12.5
Simulation/demonstration	N	N	N	N	N	N			N			N				N	N	N	3
Testing/validation	N	Y	Y	N	Y	Y			N			Y				N	Y	Y	19
Planning	N	N			N	N			N								N	N	0
Project monitoring/control	N	N			N	N			N	N	N		N			N	N	N	0
Workflow control	N	N	N		N	N			N	N	N						N	N	0
Security/access control	N	Y	Y		Y	Y			N			Y			Y		Y	Y	15
Social activities and team building	N	Y			Y	Y			N								Y	Y	18
Automated project support	N	N			N	N	N	N	N	N				N		N	N	N	0
Resource allocation	N	N			N	N			N								N	N	0
Decision support	N	N			N	N			N	N				N			N	N	0
Analysis support	N	N			N	N			N	N			N	N			N	N	0
Team coordination	N	N			N	N			N	N	N					N	N	N	0
Software coding/programming	N	Y	Y	N	Y	Y			N	Y	N			N			Y	Y	19
Network development	N	Y	Y	N	Y	Y			N	Y	N		N	N			Y	Y	16
Total Score:	0	40	9	0	27	30	4	2	0	9	0	5	0	0	4	0	40	40	120664.3


Requirements
Tool:
LiveLink
Livelink ECM - Collaboration combines a robust knowledge repository with project workspaces, polls, news channels, tasks and milestones to provide all of the tools that you need to collaborate more effectively. Specialized forums, blogs, newsletter views, FAQs and events calendars help promote shared expertise and best practices within your organization and beyond. Collaborative tools and content co-exist in an intuitive, Web-based environment to enhance your team and community collaboration experience.
Document Management is a document management solution that provides full lifecycle management for any type of electronic document. Document Management provides a single, authoritative repository for storing and organizing electronic documents.
Advanced Workflow combines a secure document repository and information retrieval with state-of-the-art process automation tools. Define, apply, and reuse business logic to improve your organizational processes.
http://www.opentext.com
Supports synchronous work and comms
Supports asynchronous work and comms
Provides real-time synchronisation of view, including user interaction
Fast, consistent response and transfer times
Graphic interface and markup functionality
Supports distributed teams
Has distinct member roles (active/passive, master/client)
Searchable/writable dbase access w/ reusable classes (federates, federations, etc.)
Supports heterogeneous software (inc non-collaborative apps)
Error tolerant
Allows for user privacy
Little user training required
Results in increased productivity
Ability to 'lock' object/file
Accommodates standard policies for use, inc processes, IP, etc.
Has context management
Includes software agents that determine what files/documents are impacted by a change
Indicates 'new', 'changed'
Maintains single version of document w/ auto-version control
Indicates Personnel Presence
Indicates Network Presence
Minimizes formatting
Templates available
Supports word processing documents
Supports spreadseeet documents
Supports presentation documents
Supports software code files
Allows application sharing & shared file editing
Supports text comms (inc e-mail, chat, etc.)
Supports audio comms
Supports video comms
Supports heterogeneous comms
Open Source
Application Trusted
Supports top-down working
Supports bottom-up working
Usable
Customisable interface (especially if proprietary application)
First impression positive
Supports heterogeneous positive
Interoperable
Supports heterogeneous platforms (including PDAs)
Is scalable to required number of users
Has automatic archiving
Has automatic backup
Has a clear, modular, flexible structure which mirrors topic area
No requirement to follow a linear work path
Audit Trail available
Permits access to other networks
Maintains Atomicity
Extensible
Registration/log on/off procedure
Selective Access (control of who sees what when)
Easy to Install
Easy to Maintain
Uses/ Goals
Communication
Design
File sharing
File storage
Archiving
Simulation/demonstration
Testing/validation
Planning
Project monitoring/control
Workflow control
Security/access control
Social activities and team building
Automated project support
Resource allocation
Decision support
Analysis support
Team coordination
Software coding/programming
Network development
Total Score:
114224

Tool:
NetMeeting
A suite of collaborative tools that leverage PCs and the internet. Including video and audio conferencing, chat, an internet directory, file transfer, program sharing, remote desktop sharing, security, advanced calling (ability to send mail to NetMeeting user or initiate NetMeeting call directly from address book), and whiteboard. The application also supports multipoint data conferencing and internet telephony/audio & video conferencing. System requirements are minimal (by today's standards) but experience has shown that the higher the system spec, the better.
http://www.microsoft.com/windows/netmeeting/

Requirements

Uses/Goals	Supports synchronous work and comms	Supports asynchronous work and comms	Provides real-time synchronisation of view, including user interaction	Fast, consistent response and transfer times	Graphic interface and markup functionality	Supports distributed teams	Has distinct member roles (active/passive, master/client)	Searchable/writable d'base access w/ resusable classes (federates, federations, etc.)	Supports heterogeneous software (inc non-collaborative apps)	Error tolerant	Allows for user privacy	Little user training required	Results in increased productivity	Ability to 'lock' object/file	Accommodates standard policies for use, inc processes, IP, etc.	Has context management	Includes software agents that determine what files/documents are impacted by a change	Indicates 'new', 'changed'	Maintains single version of document w/ auto-version control	Indicates Personnel Presence	Indicates Network Presence	Minimizes formatting	Templates available	Supports word processing documents	Supports spreadseeet documents	Supports presentation documents	Supports software code files	Allows application sharing & shared file editing	Supports text comms (inc e-mail, chat, etc.)	Supports audio comms	Supports video comms	Supports heterogeneous comms	Open Source	Application Trusted	Supports top-down working	Supports bottom-up working	Usable	Customisable interface (especially if proprietary application)	First impression positive	Supports heterogeneous platforms (including PDAs)	Interoperable	Supports heterogeneous users	is scalable to required number of users	Has automatic archiving	Has automatic backup	Has a clear, modular, flexible structure which mirrors topic area	No requirement to follow a linear work path	Audit Trail available	Permits access to other networks	Maintains Atomicity	Extensible	Registration/log on/off procedure	Selective Access (control of who sees what when)	Easy to Install	Easy to Maintain	
Communication	Y	N	Y	N	P	Y	P				Y	Y	Y		N			N		Y				Y	Y	Y		Y	P	Y	Y	N		P	N	N	Y	N	N	N	N	N	Y			N		N	Y	N			N	Y	Y	20
Design			P	N	P	Y	P	N	N	N		Y	Y	N	N	N	N		N			N	N	Y	Y	Y	Y	Y					N	P	N	N	Y	N	N	N		N	Y			N	N		Y		N			Y	Y	15
File sharing				N	P	Y	P	N	N			Y	Y	N	N			N	N					Y	Y	Y	Y	Y						P			Y	N	N	N	N	N	Y			N		N	Y	N			P	Y	Y	15
File storage						Y		N		N		N	N		N				N															N			N	N	N	N	N	N	N	N	N	N								N	N	1
Archiving						Y		N		N		N	N		N				N				N											N			N	N	N	N	N	N	N	N		N				N				N	N	1
Simulation/demonstration			N	N	N	Y	N		N	N		N	N		N								N	N	N	N	N							N			N	N	N	N	N	N	N			N			N				N	N	N	1
Testing/validation			N	N	N	Y	N		N			N	N		N	N	N				N		N	N	N	N	N							N			N	N	N	N	N	N	N			N			N				N	N	N	1
Planning					P	Y		N				Y	Y		N																			P	N	N	Y	N	N			N	Y			N								Y	Y	8
Project monitoring/control				N	N	Y	N					Y	Y		N			N	N															P	N	N	Y	N	N			N	Y			N	N	N		N			P	Y	Y	8
Workflow control				N		Y						N	N		N	N	N		N															N	N	N	N	N	N	N		N	N			N	N	N						N	N	1
Security/access control				N		Y	N				Y	Y	Y	N	N																			P			Y	N	N	N		N	Y			N			Y			Y		Y	Y	10.5
Social activities and team building	Y	N	Y			Y	P					Y	Y		N					Y				Y	Y	Y		Y	P	Y	Y	N		P			Y	N	N			N	Y			N								Y	Y	17.5
Automated project support					N	Y		N		N		N	N		N	N	N	N				N	N										N	N	N	N	N	N	N			N	N	N	N	N	N				N		N	N	N	1
Resource allocation					N	Y	N				N	N	N		N				N															N	N	N	N	N	N			N	N			N								N	N	1
Decision support				N	N	Y		N	N			N	N		N	N	N				N		N											N	N	N	N	N	N			N	N			N	N				N			N	N	1
Analysis support				N	N	Y		N	N			N	N		N	N	N						N											N	N	N	N	N	N			N	N			N	N			N	N			N	N	1
Team coordination	N	N	N	N		Y	N					N	N		N	N	N	N	N															N	N	N	N	N	N			N	N			N	N	N					N	N	N	1
Software coding/programming				N	P	Y		N	N	N		Y	Y	N	N	N	N		N				N				Y	Y	P	Y	Y	N	N	P			Y	N	N	N	N	N	Y			N	N	N			N			Y	Y	12.5
Network development					P	Y		N	N	N		Y	Y	N	N	N	N				P		N				N						N	P			Y	N	N	N	N	N	Y			N	N	N		N	N			Y	Y	8.5
Total Score:	10	0	13	0	12	19	4	0	0	0	2	45	45	0	0	0	0	0	0	10	2.5	0	0	20	20	20	15	25	7.5	15	6	0	0	14	0	0	36	0	0	0	0	0	27	0	0	0	0	0	4	0	0	4	4	36	36	56375

Requirements

Tool:
Sharepoint
Microsoft Office SharePoint Server 2007 is an integrated suite of server capabilities that can help improve organizational effectiveness by providing comprehensive content management and enterprise search, accelerating shared business processes, and facilitating information-sharing across boundaries for better business insight. Office SharePoint Server 2007 supports all intranet, extranet, and Web applications across an enterprise within one integrated platform, instead of relying on separate fragmented systems. Additionally, this collaboration and content management server provides IT professionals and developers with the platform and tools they need for server administration, application extensibility, and interoperability.
Manage content and processes, improve business insight, simplify internal and external collaboration, empower IT to make a strategic impact
http://office.microsoft.com/en-us/sharepointserver/HA101656531033.aspx

	Supports synchronous work and comms	Supports asynchronous work and comms	Provides real-time synchronisation of view, including user interaction	Fast, consistent response and transfer times	Graphic interface and markup functionality	Supports distributed teams	Has distinct member roles (active/passive, master/client)	Searchable/writable dbase access w/ reusable classes (federates, federations, etc.)	Supports heterogeneous software (inc non-collaborative apps)	Error tolerant	Allows for user privacy	Little user training required	Results in increased productivity	Ability to 'lock' object/file	Accommodates standard policies for use, inc processes, IP, etc.	Has context management	Includes software agents that determine what files/documents are impacted by a change	Indicates 'new', 'changed'	Maintains single version of document w/ auto-version control	Indicates Personnel Presence	Indicates Network Presence	Minimizes formatting	Templates available	Supports word processing documents	Supports spreadseet documents	Supports presentation documents	Supports software code files	Allows application sharing & shared file editing	Supports text comms (inc e-mail, chat, etc.)	Supports audio comms	Supports video comms	Supports heterogeneous comms	Open Source	Application Trusted	Supports top-down working	Supports bottom-up working	Usable	Customisable interface (especially if proprietary application)	First impression positive	Supports heterogeneous platforms (including PDAs)	Interoperable	Supports heterogeneous users	Is scalable to required number of users	Has automatic archiving	Has automatic backup	Has a clear, modular, flexible structure which mirrors topic area	No requirement to follow a linear work path	Audit Trail available	Permits access to other networks	Maintains Atomicity	Extensible	Registration/log on/off procedure	Selective Access (control of who sees what when)	Easy to Install	Easy to Maintain	
Communication	Y	Y	Y	P	N	Y	Y				Y	P	Y		Y				Y					Y	Y	Y		N	P	N	N	N		Y	Y	Y	Y	Y	Y	Y	N	N	N	Y			Y			Y	P	27
Design			N	P	N	Y	Y	N	P	N		P	Y	Y	Y	N	N			P			N	Y	Y	Y	Y	Y	N						N	Y	Y	Y	Y	Y	Y	N		N	Y			Y	Y		Y		Y	P	24.5
File sharing				P	N	Y	Y	N	P			P	Y	Y	Y				Y	P				Y	Y	Y	Y	Y	N						Y			Y	Y	Y	N	N	N	Y			Y		Y	Y	N		Y	P	22.5
File storage						Y		N		N		P	Y		Y					P															Y			Y	Y	Y	N	N	N	Y	Y	Y	Y						Y	P	13.5
Archiving						Y		N		N		P	Y	Y	Y					P			Y												Y			Y	Y	Y	N	N	N	Y	Y		Y			N			Y	P	14.5
Simulation/demonstration			N	N	N	N	N		N	N		N	N		N							N	N	N	N	N								N			N	N	N	N	N	N	N			N			N			N	P	0.5
Testing/validation			N	N	N	N	N		N			N	N		N	N	N				N		N	N	N	N	N								N			N	N	N	N	N	N	N			N			N			N	P	0.5
Planning					N	Y		N				P	Y		Y									Y	Y	Y									Y	Y	Y	Y	Y				N	Y			Y						Y	P	13
Project monitoring/control				P	Y	Y	Y					P	Y		Y			Y	P					Y	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y				N	Y			Y	Y	Y		N			Y	Y	P	20
Workflow control				P		Y						P	Y		Y	N	N			P					Y	Y	Y	Y	Y	Y	N				N	Y			Y	N	Y					Y							Y	P	15
Security/access control				P		Y	Y				Y	P	Y	Y	Y										Y			Y	Y	Y	N				N	Y			Y				Y					N			Y	P	15.5
Social activities and team building	Y	Y	N			P	Y					P	Y		Y				Y				Y	Y	Y		N	P	N	N	N			Y			Y	Y	Y				N	Y			Y						Y	P	18
Automated project support					Y	Y		N		N		P	Y		Y	N	N	Y				N	Y												Y	Y	Y	Y	Y	Y				N	Y	Y	Y	Y	N				Y	P	20
Resource allocation					Y	Y	Y				Y	P	Y		Y					P															Y	Y	Y	Y	Y	Y				N	Y			Y						Y	P	16.5
Decision support				P	P	Y		N	P			P	Y		Y	N	N					Y		Y											Y	Y	Y	Y	Y	Y				N	Y			Y	Y			Y		Y	P	18.5
Analysis support				P	P	Y		N	P			P	Y		Y	N	N							Y											Y	Y	Y	Y	Y	Y				N	Y			Y	Y		N	Y		Y	P	17.5
Team coordination	Y	Y	N	P		Y	Y					P	Y		Y	N	N	Y	P					Y	Y	Y									Y	Y	Y	Y	Y	Y				N	Y			Y	N	Y				Y	Y	P	20
Software coding/programming				P	N	P		N	P	N		P	P	Y	P	N	N			P			Y				N	N	P	N	N	N	N	P			P	N	N	N	P			P	Y	Y				P	P	13
Network development					N	N		N	P	N		N	N	N	N	N	N				N		N				N					N	N					N	N	N				N	N				N	P	1
Total Score:	15	15	5	20	16	15	16	0	3	0	3	40	78	5	78	0	0	25	23	10	5	0	24	20	20	20	10	0	7.5	0	0	0	0	47	30	30	62	62	62	0	0	0	47	6	4	16	15	12	4	0	20	0	20	62	38	293	182.5

Uses/ Goals

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2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.)

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3. TITLE (The complete document title as indicated on the title page. Its classification should be indicated by the appropriate abbreviation (S, C, R or U) in parentheses after the title.)

Review of Collaborative Tools for Planning and Engineering: Final Report

4. AUTHORS (last name, followed by initials – ranks, titles, etc. not to be used)

Lamoureux, Tab and Rehak, Lisa.

5. DATE OF PUBLICATION (Month and year of publication of document.)	6a. NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.)	6b. NO. OF REFS (Total cited in document.)
October 2007	70	35

7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of report, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.)

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8. SPONSORING ACTIVITY (The name of the department project office or laboratory sponsoring the research and development – include address.)

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K1A 0Z4

9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)
ARP 13jb	W7714-040900/001/SV - Task 105

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(U) The objectives of this work were (1) to survey the marketplace for available tools that may provide collaborative environments to support Synthetic Environment based exercises and experiments, and evaluate the most relevant candidates and (2) to develop an evaluation method for assessing collaborative planning and engineering tools. A literature review was conducted, followed by Subject Matter Experts (SMEs) interviews. A total of 215 collaborative tools were uncovered.

(U) In order to develop an evaluation method for these tools, it was realized that users of collaborative planning and engineering tools would have specific uses for the tools or goals for the tools known prior to tool selection. Further, specific requirements would be desired of the tools. This led to the creation of the Evaluation Matrix which was used to evaluate select collaborative tools. Research and development opportunities can also be identified through the evaluation matrix. Finally, a number of changes are proposed for the evaluation matrix. The authors feel that this project has provided an important first step toward the technological support of distributed planning and engineering teams.

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collaborative environments, software tools, tool survey, collaborative engineering, synthetic environments

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